AN INVESTIGATION OF INTELLECTUAL GROWTH IN UNDERGRADUATE BIOLOGY STUDENTS USING THE PERRY SCHEME

by

Ditshupo Bonyana Selepeng
B.Ed.(Sc.) (Botswana), M.Sc. (Glasgow)

A thesis submitted in part-fulfilment of the requirements for the Degree of Doctor of Philosophy (Ph.D.)

Centre for Science Education, Faculty of Science
University of Glasgow

TO MY SISTER KAY

"There was a time during the course of the past three years that I thought I couldn't carry on with my studies anymore. I looked at your short life and thought that maybe I was just wasting my time on this Ph.D. instead of making the most of whatever is left of my own life. Thoughts of the encouragement you used to give me however, made me remember that you would have wanted me to achieve this goal. If not for me then, it was for you – I know how proud you would have been of my efforts. You believed in me, and that made me believe in myself. I persevered, and have now come to the end of this long journey. Let's hope this marks a new and better beginning for our children's lives."

TO THE MEMORY OF MY FATHER

"Through thick and thin, I laboured with the warmth of knowledge of the fact that at the completion of my course, you would be waiting to congratulate me and tell me I had done you proud. If only you had hung in there a few hours longer, my mother would have delivered the good news to you, that I had actually achieved my goal. You took care of me all my life, and I now thought the time had come for me to happily reciprocate, but your untimely death beat me to it. I wish there was a way you could at least know I made it. You once wrote to me " Life is a journey and not a destination", I guess you would now expect me to keep my head above the waters and go on with my life. I must admit however, that without your presence, it's going to be one long journey. I guess I have to go on and celebrate with the rest of the family, but by God, I wish you were there father."

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 8

ACKNOWLEDGEMENTS

This work would not have come to fruition had it not been for the many sources of encouragement that I had right from the day I left my country to come to Glasgow. The farewell card I received from my parents read: "Those who achieve SUCCESS are those who take a DREAM and make it come true". The look in my parents' eyes, and those of the rest of my family, as I left told me that I had set myself a goal I just had to reach. I believed in the words of the renowned German Poet, Johann Wolfgang von Goethe, who said "Whatever you can do, or you dream you can, begin it. Boldness has genius, power and magic in it".

The next three years were to show me that combining responsibilities of being a mother (to two beautiful daughters) and a full-time student demanded more than just 'genius, power and magic'. Life also presented its own challenges, in all sizes and shapes, from the loss of a loved one to the loss of a chapter or two! All these I wouldn't have managed to face, had it not been for the support I got from my daughters Daisy and Thato. I would also like to express my most heartfelt gratitude to my partner and best friend, Maiky for being there for me through the most turbulent phase of my life, and for constantly urging me on. The same level of gratitude is extended to Gisela, Klaus, and Ouma Behres, who were almost like a second family to my children and me. Their kindness will never be forgotten.

I will always be indebted to my two supervisors, Prof. Alex Johnstone and Dr Mike Hansell, who took up this cumbersome job ever since I started my M.Sc. back in 1993. To say that they helped me realise my goals of achieving my degrees would be an understatement. Working with these two men was not only pleasant, but it was undoubtedly also enriching, enlightening, and most educative. I would like to believe that I have learnt enough from them to be now 'intellectually grown up' enough to deal with my coming responsibilities.

I also had to draw on the genius and support of many friends and colleagues during this course. I thank Drs Fakhir Fadhil Al-Naeme, Norman Reid, Ali Al-Shuaili, Abdullah Ambu-Saidi, Ghassan Sirhan, and Dimitris Kugiumtzis for not only offering their friendship, but for also allowing me to 'borrow their intellect', as it were. I would not have managed without their ideas and advice. I would also not have managed without the friendship and support I got from Tebelelo Kgethang, John and Ann Carnduff, Ian and Lorna King, Mosarwana Maramane, Helen Chilisa, Lekoko Serumola, Eleni Danili and Elena Skryabina.

The help I got from my trusted friend Bothi Sekgororoane over the past three years has been invaluable. Not only did she act as a real sister to me, but she also helped me with arranging for the data collection in Botswana. I would also like to thank Tebogo Molefhe, Dr Bruce Riddoch, Dr Shushu, Dr Marks Ditlhogo and all the other UB staff who helped me with my data collection. The same kind of gratitude is extended to all members of IBLS in Glasgow University, and teachers at Bellahouston Academy and Clevedon High School (Glasgow), who were kind enough to let me steal some of their valuable teaching time for my data collection.

My profound and sincere gratitude also goes to my employer and sponsor, the University of Botswana, for granting me study leave and financing my studies.

ABSTRACT

It has been the work of many science educators all over the world to try and design curricula that could help encourage intellectual growth in students. One influential work in this area was done by William Graves Perry, who managed to use students' own experiences to map out a scheme elaborating the different phases through which college students pass as they progress from year to year. This showed that students' thoughts develop from a state of basic dualism, where all is viewed as qualitative extremes without intermediates, to acknowledgement of multiplistic perspectives, through to recognition of the relativistic nature of knowledge.

Perry suggests that instructors have to find out about their students' positions along this developmental continuum in order to carve around these proper support, encouragement, and challenges necessary for ensuring further development. Communication of expectations and aims of courses is also imperative. Research has shown that students' approach to learning is usually modelled around what they perceive as being expected of them. Perry's scheme is a suitable tool for ensuring this communication, because through it, students get to relay their expectations to the staff.

Based on Perry's scheme, an attempt was made to develop a questionnaire that could be used for the investigation of intellectual growth in undergraduate biology students. This comprised of one section with opposing typical Perry 'A'(least advanced) and 'C' (most advanced) type statements, and a second free-response section where students had to justify their positions to given Perry 'A' and 'C' type statements. It was administered at universities of Botswana and Glasgow. Modified versions were also administered to pupils in two Glasgow High Schools and staff at the University of Glasgow. The aim was to find out if intellectual thought improved with progress from lower to higher educational levels and whether the staff's expectations matched those of students. The results from the two universities were also compared to find out if progress in the two universities followed the same pattern, and to see if Perry's scheme could be applied to students coming from totally different backgrounds.

It was hypothesised that there would be no significant differences between the perspectives of students from different levels of undergraduate biology courses, between those of school

pupils and university students, and between those of students and staff. These hypotheses were rejected on finding that these differences existed. High School pupils seemed to have more confidence in the system than university students. It was evident, however, that the school pupils expected more independence than the university students. This suggested that the university students might have been unchallenged. The expectations of staff were also higher than those of students. This was mostly evident where exam content was concerned. This indicated lack of proper communication. There was also evidence that what staff practised contradicted the aims of their courses, mainly achievement of independence and accountability in students. The preferred methods of assessment, for instance, could not possibly ensure intellectual growth in students, as they demand regurgitation of taught material. Though there was an overall growth in intellectual thought in students, they were observed to have problems at some points during their courses, especially at 2nd year, that hampered this growth.

It was therefore concluded that more suitable forms of assessment and instruction have to be implemented to help students grow intellectually. Most importantly, it was gathered that with minor adjustments, the questionnaire would be quite suitable for investigating intellectual growth in students, and diagnosing problems in this development.

CHAPTER ONE

INTRODUCTION

Central to all science education programmes all over the world is the common mission to produce scientifically literate students who, at the completion of their courses, would be able to approach scientific and everyday problems with confidence and creativity. To achieve this goal, the programmes must be firmly committed, not only to promoting participation of all students in challenging opportunities to learn science, but also to encouraging them to think for themselves. This could form the heart of any scientific endeavour, and by promoting it, any scientific programme would be able to instil in students the fact that learning is not just about acquiring study techniques or mastering rote memorisation skills. On the contrary, it would be instilled in students, that learning is rather more about developing an understanding and appreciation for the subject material and deriving practical applications for it.

The promotion of scientific literacy, the ability to apply scientific knowledge to aspects of one's life, is one of the main goals of science education. One can therefore, assume that the effectiveness of programmes can be judged from the type of students the programmes produce. It is also, therefore, realistic to expect that by the time the students complete their programmes they should have been provided with an adequate scientific understanding of the natural world through knowledge of the basic concepts of science, scientific methods of investigation, the nature of the scientific process, and the historical, social and intellectual contexts within which science is practised. In short, they should be armed to function as confident scientists. To achieve this, educational programmes should provide experiences that can help students develop to their maximum potential. The educational process should create a sense of excitement about learning and involve students actively in the learning process. The developing of reasoning, thinking and decision-making abilities should be emphasised.

Programmes should work toward enabling students to acquire knowledge, generating enthusiasm and initiative, and making the class or lecture room a relaxed, conducive and warm, yet challenging environment in which students can grow intellectually, enjoy and develop a curiosity for more. An effective science education programme is, therefore, one that produces socially fit individuals who have reached a level of development consonant with scientific literacy.

In most cases, students enter university straight from school, where there is not much independence on their part, but much more reliance on the teacher as a source of information. If the educational programme is effective enough, by the time the students leave university they should function at a much more mature, advanced level of thought. They should (i) demonstrate broad in-depth understanding of complex concepts and skills; (ii) make abstract, insightful, complex connections amongst ideas beyond the obvious; (iii) provide extensive evidence for inferences and justification of solutions; (iv) demonstrate the ability to apply knowledge and skills effectively and independently by applying efficient, sophisticated strategies to solve complex problems; (v) and communicate effectively and thoroughly. If the students cannot reach this advanced level of operation, there should at least be some indication that they have progressed from the most basic level to a proficient level of performance where they exhibit the above qualities, but only with a little less sophistication.

It is obvious that it should take time for students to develop to such levels, and that to get there, they should go through some intermediate levels. This progress would occur only if students know what is expected of them, and if there is a marriage between their expectations and those of the programme itself. They should have a clear understanding of what their roles as students are, what the roles of their lecturers are, what comprises scientific knowledge and what its nature is, the roles of their fellow students, and most importantly, what the purpose of assessment in their courses is. If this is made crystal clear to them, then there is a great chance that their approach to learning would be fashioned toward achieving the best in them and growing to their maximum potential.

It is a common complaint among schools and universities that science students do not perform as well as expected. This thread of despair is echoed in statements like *"science is way too difficult to learn"* or *" science is a subject for the unbelievably intellectual few"*. One can think of a plethora of reasons why this attitude exists, the most common of which is the nature of scientific knowledge. The knowledge of science is mostly abstract in nature, dealing with intangible concepts. Students are then 'forced' to learn these from pictorial and graphical representations. This does not make their life any easier, but there are ways by which this knowledge can be approached that can make its learning an enjoyable and yet challenging experience. The attitude of the students toward such knowledge can be changed in a positive manner to eliminate signs of despair, and to help them find the experience as a way of enjoying the interestingly rich realm of science. A good lecturer or teacher tries to understand his/her students' attitudes about their learning, and with these in mind, develops approaches to teaching that aim to eliminate negative attitudes and enhance the students' desire to learn.

It can also be argued that difficulties experienced in both teaching and learning of science might have a lot to do with a mismatch between lecturer and student expectations. If students' perceptions of their roles, the roles of their lecturers, and view of knowledge are not in line with what the lecturers expect, then there is bound to be a mismatch in the way both parties approach knowledge, and hence an ineffective educational process. It is imperative that departments make an effort to do away with these discrepancies. Most importantly, there has to be a move towards making sure that lecturer practices are in concert with curricular aims, on which all forms of assessment should be based. If the main aim of any programme is to produce students functioning at either an advanced or proficient level, then it must be ensured that challenges and experiences are provided for the students throughout the course, to drive them in the right direction of intellectual growth. Lack of these challenges might just lead to stagnation on the part of the students or worse still, to retreat.

It is the aim of this research project to find out to what extent intellectual growth and scientific literacy is encouraged by undergraduate biology programmes. This is surveyed as a function of the students' perceptions of the aspects of their education mentioned earlier: the roles of lecturers, their own roles, roles of their peers, and their views of knowledge and assessment. By determining the levels at which the students function throughout the course, a note of whether or not they are advancing can be made. Since different aspects of their perceptions are investigated, areas where an improvement in attitude needs be made can be pinpointed. Moreover, the survey should be able to uncover those areas where amendments need to be made in the curriculum to clarify what is expected of students.

The research is based on the scheme developed by Perry (1999). This scheme outlines stages that students pass through as they proceed with their college education. Perry's scheme was based on information gathered from students' own statements of how they perceived their education. The information was gathered in the form of questionnaires and personal interviews with the students. This research work hopes to progress in the same vein, acknowledging the fact that it lacks the crucial time scale that Perry's enjoyed. At the end of the project, a tool valid for investigating this issue of growth and development would hopefully be developed. It would mostly be appreciated for its power to act as a diagnostic tool for problems in existing programmes.

It is hypothesised that there will be a significant difference in intellectual developmental stages at which students just entering the university and those leaving are, with the latter functioning at higher levels. Since an attempt is also made to find out what the lecturers' perceptions on the same issues are, it is also hypothesised that there will be no significant differences between the lecturers' and students' views.

CHAPTER TWO

THEORETICAL AND EMPIRICAL BACKGROUND TO THE STUDY

2.1 Introduction – Why Is Science Difficult to Learn?

There exists a myriad of reasons why many find scientific knowledge unintelligible. The reasons vary from the simplistically obvious to the more deeply complex bearing some philosophical connotations. Lots of studies have been conducted in a bid to come up with solutions to problems faced by both teachers and students. Obviously, these investigations are conducted in response to particular problems faced by particular people, and as a result, different approaches have been followed based on different investigative cues.

The difficulty experienced in learning science can be attributed to a variety of reasons. Among these could be:

- Low student aptitudes; low student IQs;
- Inadequately trained teachers;
- The abstract nature of science concepts (MacGuire & Johnstone, 1987);
- Lack of ability to reason in the abstract in learners, as adult scientists commonly do (MacGuire & Johnstone, 1987);
- The complexity of the language of science (Cassels & Johnstone, 1983; Selepeng (MSc), 1995);
- Too large an amount of content presented to the learners (Gray (PhD), 1997);
- Lack of student and teacher confidence;
- Negativity in attitudes students have for the subject; and
- Mismatch between teachers' and students' ideas regarding the difficulty of topics (Bahar (MSc), 1996).

It is evident, from literature, that most problems faced by science learners have a lot to do with what is going on in classrooms. Johnstone (1991) for instance, suggests that using unnecessarily high levels of explanation in classes can mislead the students, and recommends that levels of explanation should be matched to the level of students' thinking. The use of unfamiliar materials; uselessness of ideas to students; blind memorisation of material not understood and probably contradictory to the students' own ideas, can also be deterrents to students' learning of science.

This research project is focused on undergraduate biology students' attitudes to and perceptions of certain aspects of their courses. Of most importance to the study is how they perceive their roles as students, the roles of their lecturers, scientific knowledge, working with fellow students, and their examinations. It is also important to look at the relationship between student expectations and the actual demands of the courses and lecturer expectations. It is noted that students tend to put in effort equivalent to what they perceive to be the demands of the courses and the lecturer expectations. Areas of mismatch could possibly be uncovered by such investigations, with a hope of bridging the gaps where possible.

In order to come up with strategies that might help improve the effectiveness of science education and hence make science more accessible to all, a few questions need be asked: What is the nature of scientific knowledge? How is this knowledge constructed? How should this knowledge be approached or learnt? How much authority do we, the educators and the learners, have to criticise, debunk, assess or even add to existing scientific knowledge? How much 'creativity' and actual 'discovery' is and should be allowed in science education programmes? What are the purposes of teaching science to learners? What comprises quality and effective education in science? What should lecturers do to ensure delivery of this quality education? What should the students do to best gain from their programmes? How should science teaching be organised? What is *actually* happening in science lectures, practicals, tutorials and discussions, as opposed to what *should be* taking place? What type of students do we wish to produce versus what type are we actually producing? How do the students actually see the programmes performing, in as far as promoting their intellectual development is concerned? And finally, how can science programmes be designed to achieve the necessary changes in students' attitudes to science as a subject?

2.2 Nature of Scientific Knowledge

The effectiveness with which any kind of information can be delivered is highly dependent on the nature of the information itself. It is important that both the deliverer and the recipient of the information know about the nature of whatever they are dealing with. It should not be the case of only knowing about the content of the information, but more about its nature. If students, for instance, were made more aware about the nature of science and how scientific knowledge is constructed, they would adopt a better approach to the knowledge, and see it less as fixed and intimidating, but more as flexible and enjoyable.

Students should be made aware of how existing knowledge was constructed or compiled, and how it keeps on evolving as man discovers even more finer details that were not easily visible to the early scientists, thanks to newer technologies. They should be made aware that what is currently documented is not necessarily infallible, and that it is the right of any individual to look at any existing knowledge with a questioning eye, if they so much as please, and feel free to voice their opinions if they want without feeling intimidated. This is the way forward in dealing with uncertainties that quite often afflict the body of scientific knowledge. Science educators need to inform the students of their own limitations when dealing with this knowledge, and ensure that students grow knowing that there is no such thing as the 'Absolute Truth' in science, and that what is currently documented and held as acceptable explanations to things is only a currently held view that is likely to change.

Views on the nature of knowledge have always varied, right from the early days of its origin, during the times of Plato and Socrates (Durkheim, 1914: **http://home.mira.net/~gaffcam/phil/durkheim.htm**). For scientific knowledge in particular, there exists a wealth of literature trying to outline aspects that characterise its nature. Meichtry (1993), for instance, reviewed some of the literature and came across various interpretations of these aspects. He found out that there is, however, an agreement among scientists, science educators and others that the nature of science is multifaceted and an important component of scientific literacy.

Science has been characterised as anything from social; cultural; personal and contextual versus external and 'out there'; simple and straight-forward versus complex and abstract; coherent and unproblematic versus fragmented and chaotic; limited in its ability to provide answers versus the only answer to every problem; absolute versus debatable; continuously changing versus steady and constant; and speculative versus true and real. In essence there have always been debates on its validity to provide explanations as to what is 'really' going on in the world both within and around us. It is evident that to every positive aspect associated with science, there is usually a negative to the contrary. It is this 'controversial' nature that makes science even more interesting to some, and yet intimidating to others. It is this same nature that sometimes makes it difficult to handle in classroom situations, both for the lecturers and the students. Most lecturers end up caught up in situations where they do not know how to handle conflicting ideas and how to present them to the learners. On the other hand, this can be seen as an atmosphere conducive for promoting intellectual growth in the learners, as they are faced with situations demanding serious making of decisions, choices and commitments. Some of these characteristic aspects of scientific knowledge are discussed in a little more detail below.

2.2.1 Scientific knowledge as continuously changing

> "...The course of science as revealed by historians and philosophers is far from a steady accumulation of facts, punctuated by the occasional revolution among theories. Indeed, much of the development of the most basic sciences in this century has involved grappling with the unsolved problems and paradoxes at their foundations..." (Ravetz, J.R. in Donnelly (1997), pg 8)

The view expressed in this quotation is echoed in many writings about science. There are many reasons why there is this continual change in scientific knowledge. Change is not a new phenomenon, as stated earlier, it has always existed and will continue to occur. Durkheim (1914) states that what we might refer to as 'historical knowledge' can be useful in directing our individual conduct in circumstances similar to those of the past. He further states that times change, circumstances change, and the events of history cannot recur in precisely the same way, because the conditions are different. This view is, in essence, supported by Ravetz in Donnelly (1997), who states that in evolutionary biology, for instance, Darwin's theoretical synthesis needs continuous revision and adjustments, with a lively ongoing philosophical debate about its principles. These adjustments and re-examinations to this particular theory, and many other theories for that matter, need be made to suit newly evident circumstances.

Despite the fact that there are those who have argued for the existence of 'all that needs to be known', it is clear that there is still more to be known as there are many questions that still remain unanswered. It is possible that as these are uncovered, the way things are viewed at present might change to accommodate new ways of reasoning. As Blunden (1988) states, "...at each stage in the development of western economic life knowledge has changed. People get to know the world through their acquisition of the material and cultural products of society. The transmission of knowledge is itself a technical accomplishment of society at each point in its development..." (**http://mira.net/~lynnbea/andy/knowage.htm**, pg. 3). The key word here is 'development', because as we all know, any form of development implies change, and as development occurs, new and much more advanced ways of looking at things arise. This is most evident in science, where more advanced technology and techniques lead to startling new discoveries.

Blunden (1988) goes on to state that theories change, and the objectivity of all such concepts as 'electron', 'galaxy', 'virus', etc, that are abstractions which are meaningful within theories which have their place in human history, is relative. He argues that these theories need to be evaluated accordingly when there is the first indication of them being called to question. He further states that the criticism of concepts is never complete so long as it remains at the level of contemplation or commentary. As Durkheim (1914) states, we can no longer accept a single, invariable system of categories or intellectual frameworks; the frameworks that had reason to exist in past civilisations do not have it today.

At another extreme we find some people like Horgan (1966), who wrote the book "*The end Science is nigh - Facing the Limits of Knowledge in the Twilight of Scientific Age*". This claim is totally improbable as it is quite clear that we are nowhere near approaching total understanding of our world. Despite continuing research, much is still left undiscovered. Natalie Angier, who reviewed Horgan's book in the New York Times of 30th June 1996, stated that "...researchers find hundreds of new genes practically every month, but they have no clue what the great bulk of those genes do in the body. They know that the human immunodeficiency virus causes AIDS, but have only the muddiest understanding of how the virus operates and none at all of how to stop it..." (**www.virtualschool.edu/mon/SocialConstruction/TheEndOfScience**, pg. 1). She debunks Horgan's claim that science has been successful at describing the universe, and that further research may not yield much. We are, as she puts it, just seeing the feeble streak of dawn in the scientific age.

It is the approach of the likes of Horgan to science that makes most young learners wonder if at all engaging in scientific research is worth the bother. It is this kind of thinking that makes science students believe that all they have to do is take in information as it is without either analysing or criticising it. He argues that "...the big problems that can be solved have already been solved, and that the big ones that have not been solved cannot be solved...". His pessimistic and simplistic claims that "...scientists are beginning to sense that the great era of scientific discovery is over...; the big truths, the primordial truths, the pure truths about the universe and our place in it have already been mapped...; and that science has been so spectacularly successful at describing features of the universe that further research may yield no more great revelations or revolutions but only incremental, diminishing returns..." (**www.virtualschool.edu/mon/SocialConstruction/TheEndOfScience**, pg. 2) are an embarrassment to the very fabric of science, the science that is intent in forever trying to provide possible explanations to what is going on. Such pessimism can only be seen as an expression of fear of facing reality and challenges, a trait that no educator wants to instil in his/her learners.

Scientific communities or organisations all over the world acknowledge the need to subject their views to criticism by others, with the view that this could provide useful insights to them. 'The Society of Natural Science', for example, states that as a scientific group, it holds an evolving body of theory and concepts outlining its members' views as to the nature of humanity, how well we fit into the natural world, how we should conduct our lives, and what happens to us when we die. The society further states that, being a scientific group, their body of theory and concepts is subject to modification, refinement, or even rejection as may be required by new evidence, and that they reject the concept of absolute and uncriticizable truth.

2.2.2. Scientific knowledge as paradoxical

With the construction of a body of knowledge aimed at explaining nature, by different people all over the world, there is indeed a high likelihood that disagreements will occur. Some writers have even voiced fears of the possibility that these disagreements may even go beyond simple debates, but expand into feuds that could even cause damage to that which they are trying to explain, viz. the world around us. Blunden (1988) mentioned at (**http://home.mira.net/~lynnbea/andy/know&val.htm**), for instance stated that:

> ... in a sense, we have now, in 1999, pushed the boundaries and limits of knowledge to a point where humanity has drawn into practical doubt the very existence of the planet, not as a question of speculation but as a *material possibility;* but learning how to over-come this horrific alienation of people from each other, from Nature and from themselves, which is responsible for the uncontrolled destruction of Nature and impoverishment of whole nations while others choke on luxury, is not only a problem of ethics, but also a problem of self-knowledge, of the transformation of social knowledge and belief...(pg 1)

Even though the writer voices discomfort about the feud born of the questioning of validity and limits of knowledge amongst humans, intrinsic in the quotation above is an acknowledgement of the fact that this animosity is the fruit of greed in some people. This problem cannot be seen as a result of a healthy debate between morally and psychologically sound people, but as the fruit of gluttony. In a socially fit environment, however, the conceptual knowledge must be understood, as he further states, both as a product of reflection of social relations, and therefore a 'lens' through which it is possible to perceive social relations more clearly, and also a material support or lever within any social context.

Durkheim (1914), referring specifically to the knowledge of science, seems not to understand how it can be seen as a unifying realm of knowledge when he argues that "the object of science as we see it today is precisely to represent things as if they were seen by a purely impersonal understanding... From the 'metaphysical age', that is, from the birth of the critical mind, there could no longer be a common consciousness. Comte's view was that it was science that could provide the mental equipment to reconstitute that common consciousness. Individual sciences, however, are not up to that task, since they are too specialised".

This line of argument seems to lose track of the fact that what any scientific community of today wants to achieve is a wealth of knowledge which under any circumstances, can be open to criticism, not a single body of knowledge to be accepted by all without question. The restrictive days of the past are gone. The Inquisition, which acted against the likes of Giordano Bruno (burnt at the stake in 1600) and Galileo Galilei (condemned to house arrest for life in 1633), both for defending Copernicanism, can only be read about with utter disbelief in history books. Nobody is advocating for a single and rigid line of thought. It might seem that freedom of thought and written and oral expression are a relatively recent development, (from the fact that the Holy Office's (Roman Inquisition's) Congregation of the Index of Forbidden Books was just recently abolished in 1966), but the fact of the matter is, scientific theories have always been put to rigorous tests. It is even interesting to note that in 1979, Pope John Paul II ordered an investigation into the charges against Galileo, and in 1992 the charges of heresy against him were dropped (Kari– **http://www.honors.unr.edu/~fenimore/wt202/kari.html**).

Since the need for a scientific community with a different vision from that of the past has been recognised, different scientific organisations have been formed, all echoing the same aim. Like the 'The Society of Natural Science' mentioned earlier, another organisation, the 'Society of Scientific Exploration (**http://www.scientifcecxploration.org**) and many others being formed all over the world, have a view of "fostering the study of all questions that are amenable to scientific investigation without restriction'. The 'Society of Scientific Exploration' states that there are indeed a lot of important areas that remain unexplored, some being of great public interest and touching deep philosophical questions, while others have technological potentials that could be of benefit to mankind.

With so many challenges awaiting mankind, it is imperative that people learn to work together in a much more understanding and humane manner, unlike during the practices of the past. It is this new view to the construction and handling of scientific knowledge that needs be fostered in schools and universities. If students are expected to be an integral part of the scientific community, they need to be properly trained on the tools of the trade. They need not only be *told* how the society operates, but also need to be given the opportunity to function as such during their academic life, so as to prepare them for life beyond school.

2.2.3. Scientific knowledge as relative

> ...Let us look at the reasons that pragmatism gives in order to prove that truth is subject to change. There are really two: (1) truth cannot be immutable because reality itself is not immutable; hence truth changes in time. (2) Truth cannot be one because this oneness would be incompatible with the diversity of minds; hence truth changes in space... In order to be able to say that truth has varied in time, one would have to show that a proposition can legitimately be considered true at a given moment and in particular circumstances, and that this same proposition at another moment and in other circumstances cannot be held to be true, even though it relates to the same object...(Durkheim, 1914, at **http://home.mira.net/~gaffcam/phil/durkheim.htm**, pg. 2-3)

The theme of the above quotation has already been discussed above. Whenever people work together on a similar topic, there are bound to be debates simply because people have their own unique ways of looking at things, and there is no guarantee that at any point in time, these ways could be similar. The act of debating is essential in that it gives everyone the opportunity to air their views, and weigh up which view holds most water, given certain circumstances and contexts. For any given context then, a view that makes most sense is given pride of place, and is usually accepted as the 'currently held view'. This however does not mean that everyone has to abandon their own view if not convinced of the strength of the stronger view. This blind conformity is usually practised in the case of mythological truths, not with scientific knowledge. As Durkheim (1914) puts it, once scientific thought becomes paramount, intellectual individualism appears, and the impersonal truth developed by science can leave room for everyone's individuality.

The issues of individualism and truth in science have proved to be sores not only in the eyes of many teachers, but also in those of the great scientists and philosophers themselves. The teachers end up confused as to what to deliver to the learners, given this multiplicity of views. The question is : What does one do when, as Durkheim puts it, with a given problem there is room for plurality of mental attitudes, all which in a sense are justified? How does one get to deal with the frustrating discomfort of uncertainty, and how can they make the learners face it without discouragement? Some have gone on to opt for the easiest way out, choosing that view that does not clash with their own, and presenting only that one to the learners. In the other extreme, others go on to present all the views without committing their necks to any one in particular.

Durkheim goes on to state that intellectual individualism does not necessarily imply that everyone may arbitrarily believe what he wishes to believe. He asserts that there are separable tasks within the joint enterprise , and everyone may choose his own in accordance with their temperament. He further states that on the one hand, scientific truth is not compatible with the diversity of minds; and on the other hand, as social groups become increasingly complex, it is impossible that society should have a single sense of itself, hence there are various social currents.

2.2.4 Science as ideology

So far, the answer to how teachers can deal with the frustration of relativism in classes has not been adequately provided. Some writers have even gone on to state that science should be looked at as an ideology. Robert M. Young, mentioned earlier, defines an ideology as legitimation and intrusion of values into putative facts; how frameworks get constituted; and how criteria for acceptable conclusions get established on the basis of value systems or world views. He argues that the most important concepts at work in making such decisions are (i) social location, and (ii) interest group. He claims that there is no place in science, medicine or other forms of expertise where one cannot find ideology acting as a constitutive determinant. He recalls, with condemnation, how scientists and philosophers of science 'squealed' in the 1970s that to bring ideological analysis into science would lead to unthinkable relativism. He retorts:

> ... I have never thought of myself as a relativist, but I vividly recall how academically eminently radical scientists sought to burn me and others at the stake for mounting ideological critiques of biological (Young, 1997.) and IQ research (Levidow, 1978.). By using the concept of ideology in our own view of science, instead of labelling conservative and reactionary science as ideological and therefore wrong, we were joining the polluters and abandoning the left's claim to special affinity to the truth. 'Science as an ideology', like the subsequent provocative phrase, 'science as culture', was thought to betray the bedrock of realism in the theory of knowledge of orthodox Marxism...(, http://www.shef.ac.uk/~psysc/human/chapt7.html , pg. 3)

2.2.5 Effect of the nature of science on the teaching and learning of science

All the aspects of the nature of science discussed above point towards one important aspect: that we are nowhere near finding out all about the world around us, and that as more and more things continue to be uncovered by new technologies, paradigm shifts will keep on occurring. It is also apparent that in real life, people have to learn to deal with paradoxes and conflicting theories, and to make informed choices on the basis of observed data.

With the knowledge that students will eventually enter these scenarios and meet people with all sorts of ideologies on completion of their courses, it only makes sense that they be trained or equipped with skills for dealing with such a world. Students should not be shielded from the true nature of science by saving them from confusion, but instead, they should be taught how knowledge is constructed in addition to exposing them to already existing knowledge.

No one can dispute the importance of teaching learners about their subjects before delving into the content of these subjects. At the beginning of most courses, students are usually introduced to their subjects by providing definitions of course titles and the topics to be discussed. In this attempt to provide students with some information 'about' their courses, there is always a tendency to deal with the content of the course without reference to how this knowledge is constructed, and how it is constantly being 're-shaped'. Lack of exposure of students to the true nature of their subjects, especially in science, results in students approaching knowledge as if it is a collection of historical 'heirlooms' to be passed on from generation to generation without any attempt at modifying it.

If on the other hand, students were to be let in on the construction of scientific knowledge, and be made aware that not only the 'chosen' few could contribute to this knowledge, their approach to learning this knowledge might be different. Instead of seeing bodies of knowledge as sacrosanct, they could aim at exploring them with efforts at putting in their own views. Instead of aiming at observing only what is 'expected' in laboratory classes, they could aim at providing their own interpretations and analysis of their own observations, and comparing these with what is already known. The purposes of education, especially at tertiary level, should be built around the nature of the knowledge to be handled, if it is to serve the learners well, as well as the communities within which these learners will end up functioning.

2.3 Purposes of Higher Education

Universities are responsible for imparting already existing knowledge to students and for providing the workforce of the communities within which they are built. If they cannot provide this, they will undoubtedly continue to fail their societies and governments, as the quotation below from Bennett, Dunne and Carre` (2000) indicates:

> ...Higher education is in a state of crisis – of funding, of how to conceive and manage teaching and learning and of the management of academics' time and priorities...The genesis of these various crises appears to lie in the early 1980s, when the traditional autonomy of the university sector was first challenged by both government and employers...Maclure (1987) identifies the drive to control public expenditure, coupled with a concern to obtain value for money in higher education, as the greatest influences on the way in which the framework for policy making was changed...At the same time, government was being persuaded by employers that traditional curricula were out of step with their requirements. In some sectors of the labour market there was a lessening of concern about what a graduate needs to know and increasing interest in what she or he needs to be able to do...(Bennett, Dunne, & Carre`, 2000, pg. 1)

This quotation reflects what has usually been attacked as 'instrumental' rather than 'liberal' objectives of education. Before making any judgements as to what should take precedence over what, it is important to look at purposes of higher education as outlined in literature. Tate and Thompson in Haselgrove (1994), state that in 1963, the Robbins Report (Robbins 1963) presented the view that one of the key functions of higher education was to develop the 'general powers of the mind'. This, according to Tate & Thompson, was similar to the general objectives of the Council for National Academic Awards (established in 1964), which stressed the importance of the development of students' intellectual and imaginative powers, their understanding and judgement, their problem solving skills, and their ability to see relationships within what they have learned, and to perceive their field of study in a broader perspective. The authors also state that a joint statement between the National Advisory Body and University Grants Council (1984) alluded to the fact that the abilities most valued in industrial, commercial and professional life, as well as in public and social administration, are transferable intellectual and personal skills, and that a Higher Education System which provides its students with these things is serving its society well.

Tate and Thompson further state that despite these and many other public statements about the role and purposes of higher education in relation to personal and transferable skills, higher education institutions were failing to deliver graduates in whom employers could recognise the development of such skills. It is both interesting and surprising to find that the roles of the university are being split into two components when in fact one could be seen to feed directly off the other. Jones in Billing and Furniss (1973) states that Sir Eric Ashby (1958) describes the:

> ... 'split personality' in the universities which results from conflict between those who see their function as being to 'give undivided loyalty to the kingdom of the mind' and those 'for whom the university is an institution with the urgent essential obligations to modern society'...(Ashby in Jones in Billing & Furniss, 1973, pg. 29)

Splitting these two functions of the university can be seen as downright erroneous in that in fulfilling its academic function of producing well learned scholars (both students and staff), it directly fulfils its 'political' or social function of producing people who will be able to serve the community. The only way the university could fail its society is if it failed to equip the learners with the skills that will prove useful in the community. The development of the staff's research skills should however not take place at the expense of the development of high-order intellectual skills in the learners. If the students are moulded into responsible, independent, accountable, autonomous individuals, they would in turn form part of a society with all these qualities.

Before the University of Botswana split from its partnership with Swaziland in the former University of Botswana and Swaziland (UBS), the second National Development Plan of Swaziland saw UBS as:

> ...playing an increasingly important role in the National Development not only through providing educational manpower needed, but also through (the university's) great potential as a focus of academic and cultural activities of the nation ...(University of Botswana Calendar, 1999/2000, pg. 3)

According to the same source, the same ideals were covered by the late president of the Republic of Botswana, Sir Seretse Khama in his graduation speech of May 1970, in his capacity as the then Chancellor of UBS, on stating that:

> ...The university must be a committed institution; committed to the fulfilment of the ambitions and the aspirations of the communities it was created to serve. One of these is rapid development, another is non-racialism, and the third is simply pride in ourselves and in our part, which in turn would lead to a greater

degree of self-confidence, which is one of the very basic ingredients of true independent nationhood...(University of Botswana Calendar, 1999/2000, pg. 3).

Thirty years on, the same view is shared by Botswana's Chief Justice Julian Nganunu, who, on recognising the need to respond to change stated that:

> ...Botswana's education system should prepare the school-going generation to cope with the changing world...Our education must be the tool that develops and empowers every citizen to play his part in the changing society to the maximum...For the goals of the vision (Vision 2016) to materialise, there ought to be continuous and increasing provision of educated and trainable manpower to all sectors of the economy (The Botswana Daily News Online article at www.gov.bw/cgi-bin/news.cgi?d=20000825&i=Educational system should empower and develop citizens, pg.1)

It is the move towards achieving self-confidence of a nation through developing that of citizens by empowering them that can be said to have sparked reform in education throughout the world. Firstly, the demands for social equality and economic requirements have meant that university attendants are not only drawn from the elite or privileged groups, seeing to it that most of the nation is well represented and equipped with the necessary skills and self-confidence (Beard in Billing & Furniss, 1973; Thune in Brennan, de Vries & Williams, 1997; Soden in Bryce & Humes, 1999). Secondly, all this has demanded a new approach to questions of teaching and learning and given rise to a new wave of research into the ways in which students learn, as well as to an important interdisciplinary discourse on the nature and purposes of post-school education, how it is and how it ought to be conducted (Soden in Bryce and Humes (1999).

2.4 The Changing Roles of Staff and Students – Approaches to Increasing Student Responsibility and Accountability

The recognition for the need for change in the roles of universities and other institutions providing further education has also led to the need for changes in the roles of staff and students, hence the way in which teaching and learning should be done. This change is summarised by Soden in Bryce and Humes (1999) as follows:

> ...Traditionally, teaching in universities was dominated by the mass lecture and follow-up group tutorials, with the expectation that students would engage in a good deal of self-directed reading and analysis whereas

> in the further education sector students passed their courses mainly by participating in classes which typically included exposition, questions, discussion, and supervised tasks. The picture is much more complicated now. Increasingly, students in both sectors are expected to direct their own learning, often through engagement in project work...(Soden in Bryce & Humes, 1999, pg. 604).

One could argue that these are aims of most institutions of higher education, but whether what is being expressed is being exercised remains rather uncertain. Judging from the problems which seem to indicate the mismatch between what is intended and what is practised, one could say that problems which were observed in the past are still being experienced today, despite the fact there is this recognition of the need for change. Writing in 1973, Beard in Billing & Furniss (1973) stated that:

> ...Fifteen years ago, it is unlikely that anyone would have attempted to discuss the aims of science education. No doubt every serious teacher had aims which he wished to see realised, but these were not analysed or extended to cover the whole range of teaching and evaluation of the subject. When asked to state their aims, university teachers might have answered "to develop a habit of disciplined, rational thinking" or "to enable students to study independently", but realisation of these aims was not necessarily tested. Instead, there was a fairly common tendency to emphasise teaching methods and to set examinations which favoured those who memorised most effectively and who could marshal their thoughts rapidly...(Beard in Billing & Furniss, 1973, pg. 3)

Even though today one could argue that both staff and students might be aware of what the role of higher education should be, there is still evidence that students might be being forced to assume the roles that were assumed by students in traditional teaching settings. It can be argued, as will be shown later by results of this study, that the teaching methods and assessment techniques that Beard above claimed were the cause for lack of achievement of intended goals are still at play today.

A lot of literature does indicate though, that alternative pedagogical practices and assessment techniques have been suggested or developed, but taking them on board proves to be a very slow process. Soden, in Bryce & Humes (1999), for instance, states that over the last two decades, discussion about learning and teaching has more and more centred on students' approaches to learning and the lecturer's role in facilitating more effective approaches. Tibbitts in Bridges (1997), however, states that new approaches have rarely been implemented because of a general lack of access to new experimental materials, and deeply held teaching traditions and belief systems. She asserts that:

> ...Many educators remain uncomfortable with the 'transmission mode' of teaching and continue to believe in the infallibility of the ideas and values sanctioned in texts...Thus some teachers find students' open expression confrontational, disrespectful and difficult to bear. Critical thinking is equated with unhealthy criticism...(Tibbitts in Bridges, 1997, pp. 52-53)

The new approaches to teaching and learning are centred on the shift from the instructor as the only source of knowledge and students as passive recipients, to the sharing of responsibilities between the two parties. The resources brought to these new classrooms include, according to Tibbitts, not only the teacher's ability in the subject area, but also the students' previous knowledge, abilities and potentials. She goes on to state that as in a democracy, both teacher and students are responsible to each other for a successful learning process, with the goals of instruction including the development of the intellectual, emotional and value domain, and the ability to take action.

The students' input in their own learning can therefore be seen to be the emphasis of these new methods. Opacic, in Haselgrove (1994), states that student inputs, by their very nature, meet the definition of a high quality education system since they promote openness, involve students in decision making, and allow individual voices to be heard. She is of the opinion that in most cases, students are often uncertain about the relevance of specific courses to their needs, and their expectations of higher education often conflict with reality. She believes that by drawing up what she calls 'learner agreements', staff can help students by giving them some measure of responsibility and accountability for their learning and a sense of choice and autonomy. A learner agreement, according to Opacic, gives detailed information to the student on what he/she can expect at each level. Each student ends up with a unique agreement negotiated between him/her and the lecturers. These would include course plans for students, aims and objectives of courses as well as form, regularity and publication of student feedback, according to Opacic. Common rights, she asserts, are however agreed at institutional and departmental levels.

In agreement with Opacic's notion of empowering the students is Soden in Bryce & Humes (1999) who states that much of the research done on the new approaches is based on the premise that teaching approaches which encourage learners to be more self-directed, often represented as student autonomy in learning, enhance abilities to life-long learning and employment. She states that 'Harvey & Knight report research which suggests that the main factor determining student learning is individual study outside the classroom and that teachers should give much more attention to supporting students in working independently and purposefully on worthwhile tasks" (Soden in Bryce & Humes, 1999, pg. 610).

Soden also states that research has shown that students could be engaged in either deep or shallow learning depending on different conditions of their learning environments. In deep learning, the student is said to make effective efforts to understanding and transforms content through critical engagements with ideas: appraising the evidence offered and the conclusions associated with it, and offering arguments and conclusions. Soden quotes Entwistle (1994) as stating that if students feel overburdened with work, if assessment requirements are inappropriate, and if authoritarian relationships between tutors and learners prevail, students tend to adopt ineffective surface approaches to learning.

Soden also briefly discusses the employment of problem-based learning (PBL) which crosses traditional boundaries by starting instruction with the introduction of a problem instead of the disciplinary knowledge as is custom in conventional classrooms. In PBL the students are presented with a problem in the context of a real-life scenario, and refer to different sources for the information they think could help them solve the problem. The ownership of both the processes of devising a strategy for approaching the problem, and finding relevant information empowers the student and would obviously lead to deep instead of shallow learning.

The notions of PBL, and deep and shallow learning will be discussed in more detail in Chapter 10, where it will be explained how they could work as possible means of ensuring intellectual development in students. It can be seen that, in essence, the move from traditional modes of instruction calls for more active, participatory, and independent learning on the side of the students. Students engaged in this kind of learning are bound to develop into graduates who are flexible, adaptable and quick to learn, and who can use skills such as analysis, critique and synthesis to the benefit of their organisations. Research suggests that these attributes are not only increasingly being required of all employees, but also have the potential to empower people as citizens, according to Soden.

This takes us back to the issue of the functions of the university – balancing between accountability and quality improvement in the university. By using the alternative modes of instruction suggested, it can be seen that the universities could manage to meet their own criteria for improvement in the quality of learning they aspire to achieve while at the same time they could be able to meet the criteria for accountability set down by external authorities, including the sponsors and employers of the graduates. This of course, requires that enough funds be available to the universities to afford implementing these alternative methods, which tend to be more expensive to run than the traditional methods, as shall be explained in Chapter 10.

2.5 Possible Reasons Why Reform in Educational Instruction is Slow

It has already been stated that despite the many positive points that researchers have made known about moving towards alternative pedagogical procedures, the implementation of these procedures is proving to be quite slow. This is not only the case in science, where it can be understood that more funds would obviously be needed to equip labs and classrooms to ensure that all students have a fair access to the necessary resources and apparatus. In the case of Scottish higher education for instance, Shaw in Bryce & Humes states that:

> ...The external pressures exerted by SHEFC (Scottish Higher Education Funding Council) and reports such as those of the Jarratt and Garrick Committees, together with the continuing funding crisis in higher education (COSHEP – Committee of Scottish Higher Education Principals, 1997) are causing the universities to review carefully their procedures and practices in financial and resource management. The universities are only too aware that their deteriorating financial situation requires a continuing search for improved effectiveness and efficiency in the use of resources. The universities however, are concerned that without additional resources the vision of 'higher education in the learning society' painted by the Dearing and Garrick Committees will be unrealised...(Shaw in Bryce & Humes, 1999, pg. 625).

In some cases, however, it would appear that people equate empowering students with the creation of a new state of individualism that would disregard the order of a society. Tibbitts in Bridges (1997), for instance, found out that most of the teachers she dealt with found it difficult to make the 'paradigm shift' because of their traditional, political and social environments. She gave an example of a Romanian teacher who recognised empowering students as a special moral problem for her country, where "avoidance of becoming involved was a survival tactic". This was a case of a political science subject, which could, in such cases, be a sensitive subject. The emphasis on retaining a homogenous culture could therefore lead to people being apprehensive when asked to assume individuality and independence even in learning. As a result, the instructors would rather conform to traditional modes of instruction that would make sure that everyone receives the same treatment, and abides by the rules of the society.

Cultural restrictions can also end up with dishonesty among members of a group. If people are not allowed to say exactly what they think, they could end up voicing opinions that they expect others would accept, at the expense of their own inputs. Salmon in Haselgrove (1994), for instance, states that "traditional academic debates often force people into untenable positions, obliging them, for instance, to pretend progress, disclaim personal doubts and anxieties, or maintain an expertise they do not feel". She goes on to state that "where personal concerns and personal feelings can be safely shared, the experience is characteristically liberating. For many people it comes as a revelation that other students have blocks and periods of despair". She contends that an ongoing group in which such communication is possible soon becomes a valuable resource (Salmon in Haselgrove, 1994, pg. 144).

Concern has also been raised, by another Romanian teacher, according to Tibbitts in Bridges (1997), that her students, once introduced to the concepts of individualism and individual freedom in education, were no longer willing to follow rules and compromise with others. She also states that a group of Russian educationalists also saw individualism as meaning: what is right for me; maximum self-demonstration; insensitivity to other people's feelings; non-conformism; things that are important for others are not necessarily important for me; and freedom for oneself. This is a form of understanding that can be said to be held by people who strongly believe in traditional modes of instruction, which do not foster intellectual growth in students. This will be discussed in more detail in Chapter 3, as it represents the way of thinking common at one level of Perry's scheme of intellectual development.

Apart from being expensive in fiscal terms, preparation for, and implementation of alternative modes of instruction that focus on empowering the students might also prove to be time consuming and labour intensive. This is aggravated by the fact that classes are getting bigger in size as higher education is made available to all. Gipps & Jenkins (1992) cited in Gipps (1994) support this by stating that:

> ...Diana Warwick, the general secretary of the Association of University Teachers, commenting on worsening staff-student ratios stated: "University staff are teaching more students, classes are larger and unless staff members are increased proportionally the quality of the UK degree will suffer" (emphasis added). The size of classes was only one factor. Laboratory work, seminars, and tutorials were all highly sensitive to the amount of time staff were able to devote to individual students: "It is one of the most singularly envied characteristics of British higher education that students who need individual attention can get it. Our reputation must suffer with every increase of student-staff ratios (emphasis added)...(Gipps & Jenkins (1992) in Gipps (1994), pp. 16-17).

Alternative modes of instruction require paying attention to the individual student's work from the beginning to the end, with a close eye being kept on their progress. That demands a lot of time on the sides of both the students and the lecturer, add to that the fact that the lecturer has to put in a lot of time in the preparatory phase of the programme. Gould in Fosnot (1996), states that collaborating with students and negotiating the curriculum with them is not easy because it requires considerable flexibility and ability and readiness to meet their needs; and demands receptivity to their ideas. She also asserts that "creating an authentic learning environment requires clear thinking and planning in relation to broad, long-term goals and imagination in finding specific themes, activities and materials that will spark fresh interests and make connections between those that have already been developed (Gould in Fosnot, 1996, pg. 93). It can be seen that empowering students does not necessarily mean that staff are rid of their duties, but they gain even more responsibility for ensuring that students' work is well co-ordinated.

Soden in Bryce & Humes (1999) states that students will benefit a lot more from such innovations if they are carefully initiated into all that is involved in informed analysis and critique. She realises that this requires sufficient time for face-to-face interactions which offer opportunities for a tutor to judge a student's current state of understanding, to form some notion of what it might become and engage the student in dialogue aimed at achieving the transformation. The benefits of the programmes can however, be seen to outweigh the costs. In such set-ups, both the students and staff are in touch with reality, and the students have a chance of developing high-order intellectual skills:

> ...Classrooms and schools that encourage active construction of meaning have several characteristics: They focus on big ideas rather than facts; they encourage and empower students to follow their own interests, to make connections, to reformulate ideas, and to reach unique conclusions. Teachers and students in these classrooms are aware that the world is a complex place in which multiple perspectives exist and truth is often a matter of interpretation, and they acknowledge that learning and the process of assessing learning are intricate and require student and teacher interaction as well as time, documentation, and analyses by both teacher and students...(Gould in Fosnot, 1996, pg. 93).

Most importantly, the students are being exposed to the true nature of knowledge, as their task is to interact with the world that exists. The conventional view of knowledge, as disseminated through traditional modes of instruction, would give them the idea that there is some reality 'out there' with all the right answers, to be delivered by experts. Time consuming, labour-intensive and costly as they may appear to be, the alternative methods would prove most beneficial to the students, the staff and in turn to the society at large.

2.6 Assessment of Student Learning in the Changing Face of Instruction (Roles of Peers, Students and Staff)

As Gould states in the quotation above, it is not only in the process of construction of meaning that students and their teachers need to work together, they should also interact in the assessment process. This calls for movement from traditional modes of assessment that were suitable for assessing 'learning' after traditional instruction, to alternative forms of assessment suitable for the alternative instructional procedures being proposed. As with the proposed methods of instruction, students should be empowered to have a hand in their own assessment, through collaboration with both their peers and staff.

The main issue in assessment should be that students need to know, not only what they are expected to learn, in the way of aims and objectives of the course, but also the expectations of assessment and evaluation. A proper meaningful dialogue between the staff and the students about these issues would ensure that problems like the one which is the driving force of this research do not occur or are at least kept to the minimum. If students know what is expected of them, they would try to work towards satisfying these criteria, as most students are interested in successfully completing their courses. Similarly, if students do not know what is expected of them, they would try to guess what is expected of them through observing what their lecturers practice, and then work at satisfying these 'expectations' in order to pass.

A study conducted by Cox and colleagues (Cox in Billing & Furniss, 1973) showed that students usually come to the university with certain ideas in mind, like vocational reasons, only to find themselves later wondering why they came to university. The reason for this, according to Cox, lies in the lack of clear goals and lack of involvement of students in the decision to enter higher education. Cox further asserts that the students' views of course objectives are often influenced by their perceptions of the demands imposed on them by the system of assessment. There is a need for graduates with skills and flexibility, as discussed before, but if assessment procedures do not recognise acquisition of these characteristics, students would be forced to revert to memorisation of volumes of factual information to meet the demands of the system.

Glasner in Brown & Glasner (1999) provides a brief overview on the experience of assessment of quality in UK universities since 1993 as outlined by the Higher Education Funding Council for England (HEFCE), and concludes (at the time of writing) that "in my judgement, and in the context of the data revealed by the quality assessment process, we have not yet experienced in the UK a major paradigm shift" (Glasner in Brown & Glasner , 1999, pg. 27). Whereas it was apparent that the wholesale reliance upon formal end-of-session exams as the sole mode of assessing students for the award of their degrees had effectively disappeared, Glasner observed that some radical approaches to assessment were not yet implemented.

Though there has been evidence to the effect that students feel they gain more from innovative assessment tasks, it appears like the main problem with them lies on their marking. McDowell & Sambell in Brown & Glasner (1999) state that complaints like "I think you do get more out of the exercise but that isn't reflected by the marks", are not uncommon. They state that in such cases, the problem could lie in the mismatch between assessment criteria and marking on one hand, and the tasks and the actual learning achievements which can be expected from a particular method of assessment on the other. The problem here seems to be the fact that only the end-product of the tasks is assessed without knowledge of the students' actual performance during the task.

McDowell & Sambell also state that evidence from students shows that the benefits of innovative assessment are potentially very significant, though the full potential is not always attained. They propose the following guidelines to be observed in coming up with these alternative forms of assessment (McDowell & Sambell in Brown & Glasner, 1999. Pg. 80):

- Consider student workload carefully
- Takes steps to maintain motivation
- Introduce a new form of assessment carefully
- Establish a clear framework or guidelines
- Help students to understand assessment criteria
- Pay careful attention to organisational details and procedures, and finally,
- Pay particular attention to how you award marks and for what

The different forms of alternative assessment are discussed in more detail in Chapter 10, and in almost all of them, there is emphasis on staff/student dialogue and student empowerment. The empowerment of the students is in the form of both self and peer assessment. Brew in Brown & Glasner (1999) states that self-assessment has been expressed as the involvement of students in identifying standards and/or criteria to apply to their work and making judgements about the extent to which they have met these criteria and standards. Peer assessment, on the other hand, involves students making judgements, or commenting upon each other's work.

The effectiveness of many self-assessment efforts has been made impossible by the fact that many courses in higher education have been designed in ways which inhibit the development of self-assessment skills. In some cases, students are involved in self-testing, self-rating or use of reflective questions, in which the students are not normally expected to actively engage with or question the standards and criteria which are used (Brew in Brown & Glasner, 1999). Brew goes on to state that the ability to assess effectively does not happen on its own, but students need systematic practice in judging their own work and getting feedback on their ability to do so, as they progress through their courses.

Brew also distinguishes between peer-marking and peer-feedback in peer assessment. She states that peer-marking can prove unpopular and disruptive, particularly in small, cohesive students groups, whereas peer-feedback can contribute to the cohesiveness of student groups and help them focus on learning. While some people may have been reported to argue against peer assessment on the basis that there might be inconsistency between marks generated by peers and those generated by staff even when criteria have been agreed upon, Brew cites some literature that swears on the overall benefits that this can achieve:

> ...Falchinov suggests (1986, 1995) that peer assessment leads to a number of benefits in terms of the learning process; for example, encouraging thinking, increasing learning and also students' confidence...Other more noble aims may be the motivating force behind instruction of peer assessment schemes. These have to do with the recognition that to assess is to have power over a person. Sharing the assessment with students may be to some degree in order to share the power of the teacher. It may be introduced with an intention to encourage students to take responsibility for their learning... (Brew in Brown & Glasner, 1999, pg. 161).

Brew also quotes Falchinov above as stating that care must be taken when exercising peer-assessment as having power over each other is reported to be unpopular by students. One can also never be too sure if students could not, in some cases, penalise those whom they do not like, and be too lenient on their friends. In some cases, students can even be suspicious if they believe they are being asked to do the job for which the teacher is paid, according to Brew. Attention should therefore be paid to make sure these problems are taken care of.

2.7 Conclusion

The proposal for the shift from traditional methods of instruction and assessment is based on the intention to empower and involve students as much as possible in their own learning in order to equip them with the skills they will find useful for future learning and employment. The acquisition of these high-order skills will ensure that students refrain from employing simple memorisation but learn for the purposes of keeping information for use in the long run. Engaging them actively in their learning makes them recognise that knowledge is not static, but continually changing, and that they have the power to engage in construction of their own meaningful learning, and that their instructors do not hold the key to all knowledge. They also get to experience and deal with all sorts of multiplistic perspectives in knowledge and get to appreciate that they need to be involved in making decisions and weighing up possibilities.

All the different aspects of student learning discussed above have a place in Perry's developmental theory, on which this research is based. A full description of this theory follows in Chapter 3.

CHAPTER THREE

WILLIAM GRAVES PERRY'S DEVELOPMENTAL SCHEME

3.1 Introduction

3.1.1 Development of the scheme

Those with an interest in the development and instruction of college students will appreciate the work of William Graves Perry (1999). Through listening to students over years, he managed to come up with a scheme that can help both students and their instructors have a working language to understand what they all mean, think, and believe. This scheme was, therefore, developed from students' own accounts of the lives they lived at college. Perry's scheme is nothing other than a practical tool that can be used by instructors to dig their way into their students' minds, with the sole intention of assessing not only their needs, but also their understanding and grievances as exposed by their own accounts of how they view their life at college. This would be done as a starting point to developing new ways, or amending the old ones, for instruction. Perry believed that in order to develop a faculty, the instructors would have to start off with the development of the students.

Central to this research is the problem of the mismatch between the expectations of the staff and the students, which is thought to result from lack of proper dialogue between the two parties. Perry's main thesis is that there has to be transparency in the everyday dealings between all involved in education, through which all problems can be detected and due amendments made. His main aim is to ensure that students are helped to develop to higher levels of intellectual thought using suitable methods of instruction coupled with the necessary challenges and support.

3.1.2 Need to 'listen' and respond to students

Perry's thinking was that the only way to understand the development of the students would be to listen to the students' perspectives of their college experiences. In this regard, he, like many other educators, placed a lot of emphasis on the learner as being central to the whole process of education. His main assertion was that instructors must not lose track of where the students 'are' or 'can be' in their developmental process through college. This means they ought to keep continuously up to date with students' experiences. He emphasised the need for instructors to go beyond just gathering these students' accounts, but to listen to and feel the obligation to respond to them. In Perry's view, taking heed of the students' perspectives could only be possible if the instructors believed in and respected the students. Being aware of the respect with which they are treated, students would then channel the courage in them to endeavouring to face challenges, take risks and endure the discomforts that might come with this. He was against the idea of being quick either to praise or to be negative against students when assessing them.

3.1.3 Developmental transitions – Progress from lower to upper levels of development

Perry recognised that there was a pattern in the kind of responses he got when interviewing the students. He recognised that as students progress through college, they undergo a lot of changes in the way they look at the world around them. He realised that it would be erroneous to regard the positions at which the students were, at any one point in time, as developmental stages. These positions are not rigid stages, but 'temporary resting' positions, he asserted. According to Perry, at any stage during their educational process, students should be viewed as being in developmental positions on a developmental continuum. What this means is that students can take a certain stand-point, or construct meanings on a certain issue at one point, and be able to change this standpoint as they develop to accommodate new complexities that come along with advancing in education. It is because of this that he viewed students as being in 'developmental transitions'.

3.1.4 Conditions necessary for progress through the developmental continuum

Since Perry saw students as being in 'temporary resting points' in their developmental process, their progress to upper levels on the continuum could only be sparked by the right cues and optimal conditions. He pointed out that these conditions are the necessary challenges and encouragement. A slow introduction of challenges in line with activities associated with the next higher position, for instance, would be expected to introduce a student into reasoning at that upper position. Encouragement should be given as a way of appreciating the courage the students invest in facing these challenges. He, therefore, believed in 'developmental instruction', which stresses the employment of procedures or approaches intended at encouraging cognitive and affective growth in students, and based on the nature of the students themselves.

3.2 A Brief Outline of the Scheme

Out of the many accounts of students' lives and expectations through college years that Perry compiled, he recognised a series of nine different ways by which they viewed their lives. As already stated before, he realised that these ways of looking at the world could be arranged into a developmental continuum. He regarded these ways as 'forms or structures' of intellectual and ethical development. He observed that as students progressed from year to year in their courses, the way they viewed the world around becomes more and more sophisticated or complex (with Level/Position 1 being the most basic and 9 being the most advanced). He then went on to outline the kinds of pitfalls and challenges the students are faced with as they progress through their education. Figure 3.1, below, gives a brief outline of the scheme. In this section, the different levels will not be discussed in detail, but only a representation of their relative positions is given. The levels will be treated in more detail in the next section.

Figure 3.1: A brief outline of the nine positions in Perry's Scheme of Ethical and Intellectual Development – illustrating how the levels overlap

9. Resolve

8. Multiple Commitments

7. Initial Commitment

6. Anticipation of Commitment

5. Contextual Relativism

4b. Relativism Subordinate

4a. Multiplicity Correlate

3. Multiplicity Subordinate

2. Dualism - Multiplicity Pre-legitimate

1. Basic dualism

Time scale: Progress from Year to Year

The first positions (1 - 4b) are, according to Perry, elaborations on dualism, totally different from the fifth position, in which the contextual nature of knowledge is recognised. It is stated that at these early positions, students believe, to varying degrees, on an existence of 'right/good/correct' knowledge. The last four positions involve the various processes undergone by students as they strive to make commitments in association with different aspects of their lives. The reason why I have made an overlapping-step-like presentation for these positions is that sometimes students have been seen to be in transition between the stages, according to Perry.

Perry and his colleagues also observed that college students are usually somewhere between Positions 2 and 5 in most aspects of their learning. They also observed that students are usually beyond 'Basic Dualism' by the time they reach college. These observations were investigated in this study.

3.3 The Three Main Positions in More Detail

The nine positions in Perry's scheme can be grouped into four categories: Dualism, Multiplicity, Relativism, and Commitment in Relativism (Finster, 1989). In his studies, Perry realised that most college students only managed to reach the earliest level of Relativism. In The Centre for Science Education of the University of Glasgow, the three main categories within which the university students are known to operate have come to be known as Positions 'A', 'B' and C, respectively. It has to be borne in mind, however, that the Perry 'C' category, in a wider context of the whole of Perry's scheme, includes Finster's fourth category of Commitment in Relativism. This is why it is stated in some literature that the nine levels posited by Perry can be presented in three major categories (Cross, 1998).

Position 'A' encompasses the lower levels of the scheme, where dualism is still quite strong. A look at Figure 1 above should show that this refers to Perry's positions 1 and 2. The Perry 'B' position involves a 'stage' where the individual has started to recognise pitfalls in dualism, but still has a problem dealing with multiplicity. This can be assumed, therefore, to be consonant with Position 3 in Figure 1. The lower level of Position 4 (see 4a in Figure 3.1), however, overlaps with the Perry 'B' category, as the students at this level are still grappling with multiplicity. The last category, Position 'C', encompasses the remaining parts of the scheme, Positions 4b to 9. As already stated, the most intellectually mature college students, according to Perry, would be found in the lower or earlier positions of the 'C' category (Positions 4 and 5). This is not to say that progress to the higher positions is impossible. Given the right cues and atmosphere, students should be able to progress further.

Table 3.1 below gives an illustration of this categorisation:

Table 3.1: Illustration of the categorisation of the Perry Positions

CATEGORY/ POSITION	DUALISM	MULTIPLICITY	RELATIVISM	COMMITMENT IN RELATIVISM
A	1 & 2			
B		3 & 4a		
C			4b & 5	6, 7, 8, & 9

3.3.1 Perry 'A' Positions 1 & 2 - Dualism

As already stated earlier, this position encompasses the most fundamental ways in which students look at their life in education. In the earlier part of this position (Position 1), students view the world around them in a rather clear-cut manner. Everything is looked at from extreme points of view. Issues are looked at as either ' right or wrong', 'good or bad', 'true or false', etc., with no in-betweens. According to Perry, this sort of outlook appears to derive from childhood experience, and can be attributed to a child's ascription of rightness to some sort of parental authority. About the student's use of 'in-between' perspectives, Perry (1999) states that:

> If he uses 'better' or 'worse' at all in the context of correctness or virtue, he will use them only to compare summations of discrete right-wrongs (as in the grades of spelling tests) or summations of discrete good-bads (as in the assessment "how good I've been this week"). In short, he will be found to refer to quantity, not quality... (pg. 71)

Perry goes on to explain that a genuinely qualitative meaning of 'better or worse' has no place in this position, as it would involve admission of the fact that there are others whose opinions and views are worth considering, apart from Authority. It is as such seen that only Authority has the power to evaluate opinions, and the right opinion is that given by Authority. Neutrality in opinion is also not perceivable at this stage, according to Perry.

In an educational setting, this outlook is observed in the following aspects:

(i) *Roles of lecturers and students*

The roles of lecturers and students are looked at together since one influences the other. The lecturers or instructors, are seen as Authority itself, and are therefore viewed as clearly distinct from students. They are always seen as right as opposed to the students, who possess nothing other than ill-informed and faulty knowledge. This is all blindly considered and accepted as such, without any question, because this is just the way things are.

The student's role is then simply to obey Authority without question, and do things according to what the instructors want. The students have responsibility to work hard at memorising everything they are told, which represents correct knowledge and procedures as well as the 'Truth', with the knowledge that, in the end, it will all pay off, as hard work yields good results. The students just take this in without any attempt at asking themselves what deeper meanings could be in these words, lest they misperceive or misconstrue them.

It is no wonder that Perry went on to state that this position is tantamount to the 'Age of Innocence'. He asserts that in the world of today, where most children know their 'rights' and do not yield easily to parental 'control', it is no wonder that by the time they reach university, only a very small percentage would still be in this position. It is no wonder too that those few who come in at this level 'give it up' within a few months after experiencing 'the real world', as Perry puts it. The dominance of this position at schools can also be understood, since at this stage, it sometimes 'receives explicit and implicit institutional support', in Perry's own words.

(ii) *Role of fellow students*

In as far as fellow students are concerned, the student in this position does not want to know what their views are or could be, for in his/her eyes, they are as ill-informed as him/herself in as far as possession of knowledge goes. If these fellow students did as much as try to oppose the views of lecturers, they would immediately be dismissed in favour of the lecturer's stand-point.

(iii) View of knowledge

The fact that lecturers are seen as infallible Authority means that the knowledge they impart is seen as the 'Absolute Truth'. In teaching the students, the lecturers are merely mediating between this Absolute and the student, according to Perry. The students expect the lecturer to do nothing else but help students to learn this Truth. Judgements can then be made between those 'who know their stuff and can mediate well' and those 'who don't know, mediate badly, and are more likely to be 'impostors''.

Where instructors go on to disclose of the existence of other ways of looking at things, students in this position do not want to or cannot worry themselves with these, for they only expect them to deliver that which represents the Truth. It is interesting to note that Perry observed that these students seem to give their instructors the liberty to enjoy exploring these other 'wrong interpretations', as long as they are not brought into play where instruction is concerned. All that is expected is for the instructors to 'stick to the facts' and do 'less theorising', as some of Perry's students put it.

Where the instructor's teaching is seen to be wanting, the finger of blame is pointed at their way of delivering the information, but not necessarily at the qualification of the instructor him/herself. Failure of the instructors to 'teach' the students is usually pointed out in opposition of letting students do work themselves. The younger instructors, especially, are usually accused of lack of knowledge of the right answers, as exposed by their habit of 'talking in circles' when asked questions.

It has to be noted, however, that the fact that these students can distinguish between good or bad Authority does not mean that at this stage they can accommodate pluralism in the nature of knowledge itself (Perry, 1999.). All in all, it is accepted that there exists only one right answer to any single question.

(iv) View of exams

For obvious reasons, these students would expect assessment procedures that are free of ambiguities. This is all due to their attribution of good clear-cut answers to good studentship. A good student would know all the right answers and would exhibit this in exams and tests. Students are opposed to fuzzy content and questions, and questions demanding own opinions and interpretations are seen as too much of an unnecessary challenge. Their erroneous perception of the existence of a single right answer to a question, coupled with the fact that they regard themselves as inadequate holders of true knowledge, leaves them with no comprehension of how they can be expected to give their own views or interpret information.

As Perry stated, for those students entering college at this position, this almost 'closed and rigid' way of looking at things is not meant to last forever. He asserts that as students interact with others outside the classroom, and as they begin to get exposed to the extra-curricular discussions where they tend to oppose each other's views, there begins to be a change in the way they look at things. This realisation of existence of other ways of looking at things is then transferred to the classroom. This, according to Perry, is when they move on to the later stage of the 'A' position (Position 2).

This position denotes the beginning of the movement from the strictly dualistic Position 1. Even though the students are now able to perceive Multiplicity when either introduced by the instructor or by others, it does not mean they are ready to accept it as legitimate. All the above perceptions about the roles of lecturers, peers and the students themselves, and the views of knowledge and exams, still hold, and true knowledge is still seen to exist and dominate everything else, which is still wrong.

The student perceives this multiplicity as either 'alien', as in having nothing to do with the truth accepted by the society, or as 'unreal', as in being introduced by Authority in a bid to get the students to find the truth on their own. Whereas in the earlier stage of this position students could distinguish between 'good' and 'bad' instructors on the basis of poor mediation only, and not on the nature of the knowledge itself, at this later stage this distinction is made in reaction to encountering its multiplistic nature. In the introductory chapter of Perry's (1999) book, Knefelkamp stresses that while the former dismiss statements implying multiplicity with 'a shrug of the shoulder' as to them this is inconceivable, the latter would express their disapproval of such statements with a 'an aggressive passion'.

Perry states that where multiplicity is viewed as alien, it is associated with others being 'wrong and confused', and the student being right. If it is the Authority who is seen to hold this 'wrong' view, Authority is then immediately opposed. He observed that where the students strongly opposed Authority for its presentation of multiple perspectives, some of them even ended up scorning the system as being hopeless, and/or even ended up resenting the establishment or the courses themselves. It is in this case that Dualism is coupled with anger, the anger that would unfortunately potentially block further progress from discovery of 'multiple confusions' to the discovery of Contextual Relativism.

Perry observed that while some students engaged in bitter opposition of the system, some would view the presentation of multiple perspectives as exercises for their own good, and therefore, manage to move on to the challenges that would spark their growth. Any hardships experienced are blamed on the nature of the course itself, and not on Authority, as it is still respected for its possession of knowledge. The instructors are, therefore, expected to restrict their instruction to that which is meant to deal with the course.

Having realised that instructors sometimes do present other ways which can be wrong, and want students to say something about these, the students in this position would not feel free to contribute anything in class unless they knew 'the right answer'. They do not want others to realise their uncertainties, which according to Perry, they equate to 'weaknesses'. Some students may even feel the need to know the 'truth' before going to lectures to help them face the loads of material to be presented by lecturers, the majority of which they would discard as junk, of course. The lecturer is expected to present all this 'garbage' after clearly stating what the real answers are.

Towards the end of this position, students do realise that Multiplicity in opinion does exist, but still this does not change the fact that the 'right answer' does exist. The important thing, as Perry states, is that a path toward doubt is opened, along which new perceptions will be readily assimilable.

To try and avoid the unpleasantness that comes with opposition to Multiplicity, Perry suggests that instructors present it in such a way that students know exactly what it represents, so that they do not end up questioning themselves why they are bothered with it. He states that:

> ...this development becomes positive experience only where two processes run in parallel: (i) The confrontation with diversity occurs in ways which allow a person to moderate its impact by step-like assimilations and accommodations (Positions 2-4); and the analytical and synthetic skills of contextual thought are developed (Positions 4-5) to provide an alternative to helpless despair in a world devoid of certainty...(Pg. 98)

This Perry 'A' position can therefore be summed up as that of certainty in the system.

3.3.2 Perry 'B' Position – Multiplicity subordinate

(i) View of knowledge

In this position, the students come to accept that in his pursuit for knowledge and the 'truth', man is bound to meet situations where the right answers are just out of reach. They then accept that uncertainties are legitimate. This however, does not change their perception that 'right' answers do indeed exist. The fact that 'the right answers are not yet available' is only attributed to the lack of proper ways of finding these answers, according to Perry (1999). The student begins to accept that even the instructors do not possess all the right answers, but becomes puzzled as to how they can then go on to evaluate the students' answers if they do not know the right answers yet themselves.

(ii) View of exams or any assessment procedures

The issue of evaluation becomes the main concern, and ends up affecting the students' work, as Perry (1999) states below:

> ...So far Authority has been perceived as grading on amount of rightness, achieved honest hard work, and as adding an occasional bonus for neatness and "good expression". But in the uncertainty of authorised Multiplicity, coupled with a freedom that leaves "amount of work up to you" and Authority ignorant of how much you do, rightness and hard work vanish as standards, Nothing seems to be left but "good expression"...(pg. 100)

As the above quotation shows, the students get confused about what is expected of them, and only hope "good expression", the ability to present one's argument so as to make the instructor like their line of thought, would save them. This can be equated, more or less, to using rhetoric to trick the instructor, but the students still feel they never know when and why they are going to be either marked down or up. They are still baffled by how much material would be regarded as adequate for answering questions.

At the end of the day, they expect to be fairly treated in as far as rewarding their hard work is concerned. They want the instructor to take into account the 'amount' of work done and other demands of the course. To them, multiplicity presents nothing else but increased loads of work. They tend to think that they are expected to 'take in' everything, and cannot perceive that they could be being asked to make any judgements on the material encountered, according to Perry (1999). This can be seen to explain why a lot of students tend to complain about the amount of work they have to face, if asked to read further for their exams.

(iii) Roles of instructors and students

The fact that students think there must be some 'correct' ways of finding the 'right' answer gives them awareness of the fact that they themselves have the potential to learn these ways. They view the instructor as being responsible for teaching them these ways. They have to show them 'how it is done', as some of Perry's students put it. The student on the other hand has to give it his/her all, use all their might to learn these processes.

(iv) View of peers

Since there is that 'recognition' that there is need to learn the right procedures of finding the right answers, peers are now found to be valuable in helping explore these processes. Group discussions are therefore, found to be of importance in providing the right forum for finding out how others approach the problems. However, these are just the early days of this trust in peers, and the instructor is still seen as having the final 'know-how'. Obviously where disagreements occur in these discussions or doubts crop up, the instructor would be expected to provide the knowledge on what the best process would be.

As the students continue to battle with their confusions about uncertainties presented by this multiplicity, they eventually come to endeavour to find out what it is that Authority really wants. This Perry 'B' position can therefore be summed up as that of uncertainty about oneself and about the system.

3.3.3 Perry 'C' Positions 4a – 6: Multiplicity correlate/relativism subordinate; contextual relativism; and anticipation of commitment

As with the previous positions, the students' perceptions to most aspects of their learning are mainly influenced by how they view knowledge. As already mentioned earlier, this position encompasses Positions 4-9 in Perry's scheme, but at college or university level, students are expected to or have been observed to go, as far as Position 5. It can then be expected that they would be anywhere between Positions 4 and 5. For ease of reference, in this discussion, this position will be divided into three levels, the early level (Position 4 - Multiplicity Correlate/Relativism Subordinate); the intermediate level (Position 5 – Contextual Relativism; and late Perry 'C' (Positions 6-9 – Commitment levels)

3.3.3.1 Early Perry 'C': Position 4 - Multiplicity correlate (4a - late Perry 'B')/ relativism subordinate (4b - early Perry 'C')

(i) View of knowledge

In the Perry 'B' position above, the students remained puzzled and helpless in matters of assessment. In this position, however, the students are trying to find on their own, explanations as to how Authority could actually manage to evaluate their answers even in cases where there is admittance that Authority itself does not know the right answers yet. It has to be noted that even though multiplicity is now accepted as being real, there is still that underlying question as to the existence of right answers.

Once again, as in late Perry 'A', the students could either oppose Authority or choose to go along with it, believing this presentation of multiple perspectives is done for the good of the students. The latter would therefore, seem to believe Authority is trying to teach them skills of independent thinking, these skills being those of comparative, and hence relativistic, contextual thought, according to Perry (1999).

The students in opposition of Authority fight because they believe Authority wants to force them to think in a dualistic manner, by marking their answers as if right answers exist, when in essence they are not yet in existence. They do not understand how authority can do this, while at the same time wanting them to consider that there are usually multiple perspectives to any particular issue. This to them, appears to be contradictory.

These students believe that as long as the right answer has not yet been uncovered, everyone has a right to their own opinion, and the instructors, therefore, have no right to mark then wrong. It would appear that Multiplicity here is given a legitimate position of its own (hence, Multiplicity Correlate), standing against Authority. What this now means is that Authority either knows the right answer or they don't, and if they don't, fair enough, but they should not penalise students for disagreeing with the opinions they give in class. The students still cannot find an answer as to why authority acts as it does, but believe that this is sheer injustice, as biases and prejudices are being imposed on students. According to Perry (1999), this opposition is mainly directed at low grades, and no complaints would be heard where higher grades would be given. The student described so far is obviously at the earlier stage of Position 4, i.e. 4a in Figure 3.1. The confusion that these students still wallow in, as well as the cry for justice in grading described above, also qualifies them as Perry 'B' thinkers, hence the categorisation in Table 3.1. Position 4a can therefore be seen as a transitional stage between Perry 'B' and Perry 'C' categories.

Perry acknowledges that this line of thought might serve the student well in the future where one would have to stand on one's own in times of chaotic confusion and promote an opinion against others'. However, he expresses concern that at this level it is difficult to see how this student can assimilate from this structure a perception of contextual relativistic thought. The only way out of this 'prison', Perry suggests, is for the student to demand that Authority justify itself by reasons and evidence, which in the end back-fires, as this necessitates that they do the same.

The students choosing to adhere to the ways of Authority follow a path that would easily lead to relativistic thought, according to Perry. They realise that the issue is no longer 'what Authority wants' but 'the way they want you to think about things'. They see Authority as wanting them to think about different issues and find the most sensible way of looking at these, to form one's own opinion.

Unlike the student in opposition to Authority, who tends to think that 'anything goes', the student here recognises that there is an element of 'weighing out' possibilities in Multiplicity. This mode of thought is, to put it in Perry's own words, "the structural foundation of Relativism, which involves meta-thinking, thinking about thinking". Perry suggests that students tend to believe that this comparison of different approaches to a problem is equivalent to 'independent thinking', and believe that by doing this, they are merely doing what is expected of them.

It would appear that what the student believes is that for each problem there exists several different approaches that would yield several different answers, depending on how he/she reasons things out. This might be what most students would refer to as being open-minded, or being able to accept that others could also have their own opinions, depending on how they approach the problem. Unlike in the case of opposition of Authority, here there seems to be tolerance of others' opinions. This according to Perry, seems to bring order in what would previously have been viewed as chaotic and confusing Multiplicity, and freedom from the previously rigid structure of Dualism. He continues to assert that there is then a distinction between beliefs based on blind faith, as in Dualism, and beliefs based on some element of rationalisation.

(ii) *Role of students*

The fact that Authority 'allows' students to engage in this 'independent thinking' is deeply appreciated, and makes them enjoy a new sense of responsibility (Perry, 1999). Students believe it is up to them to take more responsibility for their studies if they would like to pass. This responsibility is seen as the need to work harder, read more sources than one and get different opinions and see how they are derived, instead of just remaining loyal to one way of thinking without certainty that this could be the 'truth'. This shows that the students remain unsure of the validity of different theories and opinions as compared to each other. In essence, they still believe that each way of thinking has its own validity, and that if one presents more than one line of thought, they stand a better chance of representing the 'truth' and a better answer, than if they present only one view. Because of this way of looking at things, Perry decided that these students must view Relativism as Subordinate (Position 4b).

(iii) Role of instructors

The instructors are expected to help the students by modelling the way they want them to think, showing them what the good approaches to problems are. However, since there are different ways of looking at things, instructors are no longer seen as infallible holders of the 'Absolute Truth'.

(iv) Role of peers

As already stated, others' views can now be tolerated and accepted as legitimate. The students now enjoy working with others and believe they can learn a lot from them and use their views to broaden their own scopes of learning.

(v) View of exams and of forms of assessment

Students believe that evidence of independent thought should grant them good grades. Independent thought here could mean presentation of all the multiple perspectives to an issue with all the supporting evidence. It is no longer the issue of the quantity of the material presented, but more of the quality. In some cases the students might even just decide to give the instructors what they think they want, no matter what they themselves think.

3.3.3.2 Intermediate Perry 'C': Position 5 – Contextual relativism

(i) View of Knowledge

This far, the students have not quite 'overburdened' themselves with the responsibility of determining whether the different opinions could be reasonable or not. The issue of 'reasoning things out' was merely related to providing supporting evidence for all the available ways of looking to issues. In short, reasoning could have been equated to providing supporting evidence. According to Perry, students in Position 4 perceive knowledge in two different ways. On one hand, they perceive that there are still things that are either right or wrong, and to which Authority knows the answers. On the other hand there are those matters in which the right answers has not been determined, in which one has to consider several different approaches and opinions. One can therefore just argue about the degree with which each approach is coherent with the data being presented (Perry, 1999).

As the student progresses into Position 5 however, they begin to extend their 'reasoning' into trying to find out the relative 'reasonability' of each approach in given contexts (Perry, 1999). Where relativity was first seen as 'the way they want us to think' it is now accepted and found to be appropriate in many situations. Perry suggests that the transition from Position 4 to 5 could then be due to the fact that relativistic thinking gradually becomes habitual, as it even extends beyond college work and is applied to 'real life' situations as well. It then becomes a quality part of all knowledge, instead of being 'a way of looking at things', sought by Authority. They then begin to see cases of 'right or wrong' as special cases, as they progress to Position 5.

This regard of relativity as the norm, as opposed to simplistic thought, is usually echoed in the students' retorts that 'that's just the way things are', or as in an example of one of Perry's students, it is taken to be 'the way of looking at things'. Perry believes that in actual fact, 'to the students, the way of thinking' seems to be one with 'the way things are'.

All in all, the students accept that there is no such thing as the 'Absolute Truth' where knowledge is concerned, and views could only be right or wrong within a specific context, and judgements on this could only be made on the basis of 'rules of adequacy' that are determined by expertise (Knefelkamp in Perry (1999)).

Perry (1999) further states that "...relativism is here just taken to be context, without any thought as to what this implies on the part of the student." This means that students believe that the 'extent of truth' of any knowledge depends on context, without having noticed any demand to make their own choices as to which thinking is more in line with their own thinking.

Since there existed two ways in which students viewed knowledge in Position 4, it is easy to understand how Perry and his colleagues observed that there were two paths along which students moved from Position 4 to Position 5. One line of development was from the level of Relativism Subordinate, while the other was from Multiplicity Correlate. Even though the former was based on adherence to the way Authority seemed to want students to think, and the latter to opposition of what was thought to be the unrealistically ambivalent nature of Authority, both eventually lead to a realisation that Authority is indeed engaged in the same type of thinking as the students. At the end of this position, relativism is completely generalised and all knowledge is perceived as relative.

(ii) Role of students

The fact that at this stage the students have not yet realised the need to identify themselves with or commit to particular ways of knowing is the key feature that distinguishes this position from the later ones in this developmental scheme. The students undergo a lot of changes in themselves as they experience this new way of knowing. These changes include the moving away from previous beliefs that were held blindly to those that involve much more thought and reasoning; realising that one is actually 'more mature' in their thought and can think in relative terms instead of conforming to ways which everyone else follows for their comfort and convenience.

(iii) View and role of instructors

Perry noted that a changed view of authorities is also experienced; they are no longer seen as 'Authority' itself but as having a functional role in the community, of representing the authorities. Students no longer view them as master 'truth holders' but as people going through the same things they, the students are going through, only that authorities would have more enlightenment. As such they find them more tolerable and easy to disagree with where one finds their views questionable. Even those who used to oppose the former perception of Authority passionately become subdued by this new view, according to Perry. He further asserts that even when the students realise that there exists, among instructors, those who still belong to the old school of thought where they view themselves as 'Authority', the students would still develop effective mutuality.

(iv) View of peers

As students begin to accept that instructors are people just like themselves, this then drafts into the way they deal with the rest of the community, including peers. They come to respect their views. As they listen to others, they begin to have the ability to detach themselves from their standpoint and be willing to consider other contexts objectively before being emotionally attached to one way of looking at a problem.

Perry noted that, in many students, this sense of the need to be objective brings with it the sense of loss where one feels they might have to abandon what they used to see as making sense and were very happy with, because on 'stepping out' of it and giving it a clear look, they would find flaws in their own ways of thinking. As a result, most students would then choose to present different approaches with their qualifications, because at this stage, taking up a stance is not yet an issue according to Perry.

3.3.3.3 Late Perry 'C': Positions 6,7,8 and 9 - Towards making and experiencing commitments in relativism

It is not necessary here to go into too much detail about these later positions of the scheme as they do not seem to have too much bearing on the development of students at college or university level. However, their importance is acknowledged as it is the wish of universities to develop students to levels where they can be functional in the community post higher education. The fact that they are not being discussed in detail does not undermine the need to develop students beyond just Contextual Relativism.

As students get more and more used to relativistic thinking they might seem to be too engrossed in this way of thinking to be aware of a need to seek their own identity through commitment to certain ways of thought. They feel at a loss to say whether this process of bringing about order to their thinking is possible without ending up in self-contradiction (Perry, 1999). They might indicate awareness of the need for commitment, but they could never tell how this could be achieved. What one avoids doing is to be quick to condemn other views without giving a chance to explore them first, giving them the respect they deserve. It is noted that in order for students to reach these levels, the necessary challenges and encouragement must be provided.

This Perry 'C' position can therefore be summed up as a position of self-confidence.

CHAPTER 4

METHODOLOGY

4.1 Research Design

4.1.1 Populations of study

The initial aim of the project was to produce an instrument that could, at the end of the project, be suitable for use in Botswana, therefore, the original intention was to do both the piloting of the instrument, and the data collection in Botswana. However after weighing up all the pros and cons of collecting all the data there, it was decided that the University of Glasgow (GU) be used as the main population of study, with the University of Botswana (UB) fitted in only if that proved possible, providing additional comparative data.

It was decided that the ideal way to assess if there was any development in students as they progressed through the university would have been to follow one group of students from their first to their final or fourth year. The problem with this would have been two-fold. Firstly, due to the three-year time constraint of the project, the group could have only been followed up to third year. An attempt was, however, made to follow one group of students from 1st to 3rd Year as it was believed that valuable information could still be obtained from this. Secondly, lot of 'subjects' would have been lost through the years as the students split into their biological science specialisations. It was then decided that all undergraduate biology students in the University of Glasgow, from first to fourth year, be targeted as the main population of study. It was anticipated that getting hold of all of them would be impossible, but still reasonable sample sizes would be obtainable.

The study was also interested in finding out how final year High School pupils compared with first year university students in their perceptions of the whole process of learning. This would give an insight into whether early university experience had any effect on how the students viewed the world around them. Two High Schools in the Glasgow area, Cleveland High

School and Bellahouston Academy consented to the use of their final year (S 5/6) pupils as the High School population.

It was felt that in addition to qualifying the nature of changes in student perceptions, it was important also to assess if these matched the expectations of their lecturers. It was, therefore, decided that the perceptions of members of the Institute of Biomedical and Life Sciences involved in the teaching of undergraduate biology students be investigated and compared with those of the students.

As the study progressed, an opportunity for data collection in Botswana opened up. Students at all stages of undergraduate biology courses in the University of Botswana were then added to the population of study. Collecting data in the two universities would provide a good insight as to whether the instrument indeed measured what it purported to measure. Differences in cultural background aside, a parallel study could therefore be conducted between the two universities, to find out if indeed Perry's scheme could be applied to any college or university population, regardless of its origin.

4.1.2 Sample selection

4.1.2.1 The High School sample

The numbers of pupils doing science in their final year of study in both Cleveland High School and Bellahouston Academy were low compared to university classes. However, an attempt was made to get as many as possible taking part in the research. This comprised 20 pupils in Bellahouston and 31 in Cleveland, managed to take part, making it a total sample of 51 pupils.

4.1.2.2 The staff sample

A reasonable sample of 60 members of staff was obtained after sending out 165 questionnaires by mail. The intention was to target as many members of staff as possible, as low return rates are common when an attempt to collect data this way is made.

4.1.2.3 The University of Glasgow samples

The group followed from 1st to 3rd Year

A sample of 677 students was obtained from the 1997/98 1st Year group in March 1998. An attempt was made to get two measurements for each year of study, one at the beginning and one at the end of the year. Only this one measurement could be made at late 1st Year. Only 196 of these students could be sampled in the early part of their 2nd Year (November 1998). The sample thinned out even further in the late part of 2nd Year (April 1999), when a sample of only 54 students was obtained.

Getting hold of a 3rd Year sample was difficult as the students had already split up into their biological science specialisations. Only 37 students from the initial 677 could be reached in February and March of 2000, forming the 3rd year sample. Of this 37, only 19 had managed to fill the questionnaires in 1st, 2nd and 3rd year. The rest had only managed to do so in their 1st and 3rd years. These 37 students were then used in drawing out trends in the changes in student perceptions as they progressed from 1st to 3rd Year.

Samples for inter-group comparisons

An attempt was made to get a larger group of 3rd year students at the same time to use in inter-group comparisons. A sample of 38 3rd year students was obtained from the 1996 entrants. This group could not be added to the 37 1997 entrants followed from 1st year to make a bigger 3rd year sample, because the 1996 entrants filled the questionnaire during the early part of their 3rd year, while the 1997 entrants filled it in during the later part of their 3rd year. A comparison of early 2nd Year and late 2nd Year results had shown that there were marked differences in the perceptions of students at these two stages of a single year, so grouping the two 3rd Year groups could prove misleading.

The inter-group comparison samples therefore consisted of 677 1st Year, 196 early 2nd Year, 54 late 2nd Year, 38 3rd Year and 54 4th Year (1995 entrants) students. Varied as the sample sizes might have been, they were to provide very interesting trends in the results, as will be seen later in the results section.

It was very difficult to find 'free' times during which students could fill in the questionnaires, and 'take-away' attempts were futile. Sample selection was then left to the chance event of any member of staff being willing to allow time for the administration of the questionnaires during their lectures, labs or tutorials. As a result, no particular numbers were targeted, but an attempt was made to consult as many staff members as possible to increase chances of getting reasonable student samples.

4.1.2.4 The University of Botswana samples

The simple principle of targeting as many students as possible was also applied in the University of Botswana. Samples of 205 First Year, 151 Second Year, 71 Third Year and 48 Fourth Year students were obtained. Due to time constraints, data could not be collected from the staff population. Access to students in the University of Botswana however, seemed much simpler than it was in the University of Glasgow.

Table 4.1 below gives a summary of the sample sizes from the different populations:

Table 4.1: Summary of Sample Sizes and Dates of Data Collection

	High School	**1st Year**	**Early 2nd Year**	**Late 2nd Year**	**3rd Year**	**4th Year**	**Staff**
High School	51 Mar. 98						
GU Followed		19 (March 98)	19 (Nov. 98)	19 (Apr. 99)	37 *(19 + 18)* Feb/Mar 00		
GU Inter-Group		677 (March. 98)	196 (Nov. 98)	54 (Apr. 99)	38 (Oct. 99)	54 (Dec. 99)	60 (Nov. 99)
UB		205 (Nov. 99)	151 (Nov. 99)		71 (Nov. 99)	48 (Nov. 99)	

Note: *the numbers in italics are the 19 students who filled the questionnaire at 1st to 3rd Year, and the 18 who did so only at 1st and 3rd Year.*

4.2 Research Instrumentation

4.2.1 Construction of the instrument

4.2.1.1 Item pool for both parts of the questionnaire

After going through appropriate literature on intellectual development in college and university students, especially Perry's work, several statements reflecting possible perceptions of students were compiled, forming a pool of items from which items for the instrument would be drawn. These were statements that represented extremes of the Perry Scheme, i.e. Perry 'A' (least advanced) and 'C' (most advanced) Positions, (see Figure 3.1 in Chapter 3). The statements represented perceptions alluding to roles of students and lecturers in the educational process, roles of peers, view of the knowledge of science (with emphasis on biology), and view of examinations (structure and content). For each of the statements, and attempt was made to come up with an opposing statement, for use in Part 1 of the Questionnaire. This means for every 'Perry 'A' statement, a counterpart Perry 'C' statement was drawn, and vice versa.

4.2.1.2 Part 1 of questionnaire: Draft of a bipolar instrument

The research instrument, a questionnaire was divided into two parts. The first part, (Appendix 1a) consists of 11 statements drawn from the item pool mentioned above, along with their opposing statements. Between each of the opposing statements was placed a five-point scale. Each of the two positions on the left and right of the middle position indicates the extent of agreement with either one of the two statements. The middle position obviously indicates a neutral position, which, in effect, would signify a Perry 'B' position in the Perry scheme. This was based on the structure of the semantic differential technique developed by Charles Osgood (1952) in his study of "The Nature and Measurement of Meaning". An example of a bipolar item (not from the questionnaire) is given below:

	SA	A	N	A	SA	
Alcohol is bad for one's health	◯	◯	◯	◯	◯	Alcohol is good for one's health

Any one responding to the item above could either strongly agree (SA) or mildly do so (A) with either one of the extremes of the statement. Choosing a position closest to the statement indicates a strong agreement, while a position two places away from the statement indicates a mild agreement. Choosing the middle position indicates a neutral view to the issue.

4.2.1.3 Advantages of the bipolar scale

This bipolar nature of the scale provided students with the opportunity to consider the two extremes carefully before choosing a position along the scale. In the past, work done on Perry in the Centre for Science Education at the University of Glasgow involved the use of instruments with single Perry 'A', 'B' or 'C' statements followed by five-point scales. The problem that came with this was that if a respondent disagreed with a Perry 'B' statement, it was not easy to tell whether this meant they assumed a Perry 'A' or 'C' position. This bipolar scale now meant 'B' positions could easily be identified.

The orientation of the extreme positions was varied, so that Perry 'C' statements were not always found on the same side of the scale. This too, had an advantage that respondents were forced to consider the statements carefully before making their choices.

4.2.1.4 Part 2 of the Questionnaire

The second part of the questionnaire consisted of six single statements, also drawn from the item pool, to which the respondents had to indicate whether they agreed or not, and then go on to justify their decisions in the spaces provided (Appendix 1b). The purpose of this part was to provide the respondents with an opportunity to put their perceptions in their own words. This would prove useful in explaining the choices made in the first part of the questionnaire, since the items in the two parts were related. Since the statements given were either Perry 'A' or Perry 'C' statements, it was assumed that a disagreement with a statement could imply either the opposite extreme or a Perry 'B' statement, and the justification would provide a proper insight as to what it was. The justifications were also useful in identifying situations where the respondents seemed to be in transition between stages.

4.2.1.5 Adaptation of the instrument to suit other research samples

Since the instrument was mainly geared towards collecting data at university level, it had to be adapted to suit the High School and Staff samples (Appendices 2 and 3 respectively). This involved minor alterations of language and substitutions of words to suit the levels, e.g. teacher substituted for lecturer; students for pupil, etc. An effort was made not to alter the meanings of the statements though.

4.2.2 Validation of instrument

During and after its construction, the instrument was rigorously checked for its validity (to see whether it was fit to measure what it intended) by my two supervisors, Professor Alex Johnstone and Dr Mike Hansell. Its first application, to the first year students at the University of Glasgow in 1997,was considered to be a 'piloting exercise' in the hope of exposing those items that needed amending, based on the nature of the students' responses. The value of this was demonstrated since some of the items indeed needed re-phrasing, while one of them, the last question in the second part of the questionnaire, needed to be totally replaced, as it did not measure what it was intended to measure. The question was changed from " I am very confident I will pass this course" to " I am very confident in myself and like expressing my opinions and views in class, discussions, labs, etc." It was observed that some of the responses to the initial question could either be Perry 'A' or 'C' statements, depending on how they were looked at, for instance, "If I work hard enough I should be able to pass". A Perry 'A' student would consider spending hours on end cramming material without understanding as working hard, while a Perry 'C' students would consider looking for meaning and understanding in material as working hard. These amendments were necessarily considered in the analysis of the data.

The data from Botswana also gave some insights as to areas where the Batswana students could easily misconstrue the statements, a useful input to be considered later when using the instrument for long-term research in Botswana.

Even more enlightening and useful were comments received from members of staff (Appendix 4) after completing the questionnaire. All these contributions would help in the polishing up of the instrument for use on a larger scale and long-term studies to be conducted in Botswana after this project.

4.3 Data Collection

4.3.1 Administration of questionnaires

The dates of data collection are included in Table 4.1 (pg. 52) together with the sample sizes. It took about twenty minutes for the students to fill both parts of the questionnaire.

4.3.2 An attempt at conducting follow-up discussions/interviews

The initial idea was to follow up students who had managed to fill in questionnaires from first to third year with 'one-to-one' interviews that would have helped provide answers to why their perceptions might have changed or not changed over the years. These interviews would have also provided some personal experiences of university life as related by the students themselves. However, as with the administration of questionnaires, there were difficulties in finding students willing to give up some of their time to do this. Invitations to these interviews were sent out through e-mail, and the few students who responded either apologised for being unable to find time due to their busy schedules, or instead preferred to come for group discussions. After conducting one one-to-one interview and one group discussion with four students, it was discovered that the tape recorders used were faulty, and therefore resulted in the production of inaudible tapes. An attempt at transcribing the tapes was made, but proved futile.

4.4 Data Analysis

4.4.1 General processing of the data

The data from all the samples were entered into the Excel spreadsheet. In the first part of the questionnaire, frequencies of students going for each of the five positions were then computed(Appendix 5). The polarities of the questions were then corrected such that positions 1 and 2 represented Perry Position 'A', position 3 to reflect the 'Perry B' position, and 4 and 5 to represent the 'Perry C' position. For inter-group comparisons, these frequencies were changed to percentages, for the construction of more comparable distribution graphs. *(Important note: all the distributions are represented in graphical form, not to imply that there is a cause/effect relationship between the x-axis (positions on the scale) and the y-axis (proportion of students), but only to make the separate distributions more distinct from each other. A more appropriate representation would be in the form of histograms, but because there are many groups being compared, the distributions become too clustered, and the different groups are not easy to distinguish from each other).*

For the group that was followed from 1st Year, there was no need to convert the frequencies to percentages. Chi-square statistics were then computed as appropriate, using raw frequencies in all cases. This was done to find out the level of significance of any observed differences between the distributions of the groups among the Perry categories for each item on the questionnaire.

The results from the second part of the questionnaire were also entered into the Excel spreadsheet. The responses to each of the six questions were categorised according to the Perry 'A', 'B' and 'C' positions. For each group, percentages of respondents voicing each of the three positions were computed. Comparisons between groups were then carried out on the basis of the frequency distributions and computed chi-square statistics.

All the analyses that were carried out are described in the next section.

4.4.2 Comparisons between High School and GU Level 1

Null hypothesis: There is no significant difference between the perceptions of final year High School pupils and those of Level 1 University students in as far as the different aspects of their learning are concerned.

4.4.2.1 Part 1 analysis

As already stated before, the GU raw frequencies recorded in Appendix 5 were then converted to percentages. The use of raw frequencies in the comparison of the distributions of these two groups would have been erroneous because of the different sample sizes (51 High School pupils versus 677 1^{st} Year students). The results were recorded in Tables 5.1a - 5.1k in the results section (Chapter 5). Line distributions were then drawn, Figures 5.1a–5.1k, to compare the distributions of these two groups. To check if the differences observed between these groups were significant, a chi-square statistic was then computed on the raw frequencies for every item on the questionnaire, and the results recorded in Table 5.2 (Chapter 5). Based on these findings, conclusions were drawn on whether the two groups varied significantly in their perceptions.

The questions were also ranked according to the proportions of Perry 'A', 'B' or 'C' thinkers they generated, to find out which ones exposed problems with students' perceptions. The High School results were recorded in Table 5.3 while those of Level 1 were recorded in Table 5.4. The differences in the proportions of Perry 'B' thinkers in the two groups were also calculated, and the results recorded in Table 5.5.

4.4.2.2 Part 2 analysis

For each of the two groups, the statements obtained for each question were categorised according to the Perry positions 'A', 'B' or 'C'. The results for the High School categories were recorded in Appendix 6a-f. The results for the Level 1 students were recorded in Appendix 7 a-f, together with those of other GU Levels. The percentages of pupils going for the different categories for these two groups were calculated and recorded in Table 5.6, in Chapter 5. A chi-square statistic was then calculated for each question using the raw frequencies to check the level of significance of the differences. The results were recorded in Table 5.7 in Chapter 5. Based on the findings in both Parts 1 and 2, conclusions were made as to how the perceptions compared in the two levels.

4.4.3 Comparisons of the different Levels at GU

> **Null Hypothesis:** There is no significant difference between the perceptions of students in the different levels of undergraduate biology courses at GU, as far as aspects of their learning are concerned.

4.4.3.1 Part 1 analysis

Since the groups had different numbers of respondents in their samples, the frequencies were converted to percentages, and the results recorded in Tables 6.1a–6.1k in Chapter 6, together with the percentages for the staff. Line distributions were then drawn based on the percentage distributions, comparing the different levels, including the staff (Figures 6.1a–6.1k in Chapter 6).

An attempt was also made to try to find out whether the students grew intellectually as they progressed through their courses. This was done through ranking the proportions of students in the different levels within each of the three Perry categories. The results were recorded in Table 6.3, in Chapter 6. From these results an estimation of the possible rank-orders could be drawn.

Chi-square statistics were calculated for comparisons between the following groups:

- Level 1(L1) with early level 2(L2e)
- L1 with late level 2(L2l)
- L1 with level 3(L3)
- L1 with level 4
- L2e with L2l
- L2e with L3
- L2e with L4

• L21 with L3
• L3 with L4

The results were recorded in Table 6.4, Chapter 6. From these results reasonable conclusions could be drawn about the level of significance of differences observed between the different groups.

4.4.3.2 Part 2 analysis

As in Section 4.4.2 above, the responses from the different groups were categorised according to the Perry positions "A', 'B' and 'C' for each question, and the results recorded in Appendix 7a - 7f. The summary of the results was presented in Table 6.5, Chapter 6. Comparisons were then made between groups for each question, based on these percentage distributions. A chi-square statistic was then applied to the raw data to find out the levels of significance of differences, if any, between the groups for each question. The results were recorded in Table 6.6 in Chapter 6.

Based on these results, together with those obtained in Part 1 analysis, conclusions were drawn whether to accept the Null Hypothesis or not, hence whether the groups were significantly different in their perceptions or not. This was taken to indicate whether there was any progress in the intellectual development of the students as they progressed through their courses. The results were also used to try and estimate the rank-order of intellectual development in the different GU levels.

4.4.4 Comparison of GU students' perceptions with those of members of staff

4.4.4.1 Part 1 analysis

As mentioned earlier, to find out if there were any agreements or disagreements between members of staff and students on the different aspects of teaching and learning, comparisons had to be made between their distributions. Conclusions were drawn on the relevant line distributions (Figures 6.1a – 6.1k) which were imported from Chapter 6 to Chapter 7, where this analysis was done, and re-assigned labelling as Figures 7.1 a-k (i).

Chi-square statistics were also calculated for each question to make comparisons between the distributions of staff and those of each level. The results were recorded in Table 7.5 in Chapter 7.

4.4.4.2 Part 2 analysis

The comments of Staff to Part 2 were recorded in Appendix 10. The proportions of the members of staff giving the different Perry statements were recorded alongside the GU students' proportions in Table 6.5 (Chapter 6). The staff results were then compared with those of the different levels of students. Further feedback from the members of staff on the questionnaire itself and on some other issues concerning students' learning, was recorded in Appendix 4, as mentioned earlier.

4.4.5 Analysis of the results of the group followed from Level 1 to 3

4.4.5.1 Part 1 analysis

As already stated, only 37 students managed to fill in the questionnaires from first year to third year, with only 19 of them filling them in at all of the three levels. The analysis of the results was based mainly on the results from those who filled the questionnaire at all three levels, with the other 18 being used to confirm any observed trends. The raw results indicating the different options the students went for during the three years were recorded in Appendix 8. The focus of the research was on how these students' perceptions changed as they moved from year to year. The analysis of these results was therefore based on finding out changes in perceptions between Level 1 and Level 2, Level 2 and Level 3, as well as the overall changes observed between Level 1 and Level 3. Different permutations of the options on the questionnaire scale were drafted, and the number of students (as well as their percentages) opting for the different combinations between any two years were recorded. This was done for all the 11 questions on this part of the questionnaire.

A record of the numbers and proportions of students undergoing the different changes in perceptions (or choosing different options on the questionnaire scale) between Level 1 and Level 2 was given in Appendix 13. From this record, it was determined which type of change was most popular. It was also possible to determine the degrees of growth (movement from lower to higher positions in Perry's Scheme), regression (movement from higher to lower positions on the scheme), and stabilisation (no change in positions). A summary of the directions and magnitudes of changes in students' perceptions between Levels 1 and 2 was given in Table 8.1.

A similar analysis was done for the students' progression from Level 2 to Level 3. The results were recorded in Appendix 14 and Table 8.2 respectively. For the overall progression from Level 1 to Level 3, the results were recorded in Appendix 15 and Table 8.3. A summary of the observed changes in the whole group of 37 students was given in Table 8.4.

4.4.5.2 Part 2 analysis

The students' comments to Part 2 questions were recorded in Appendix 9. These responses were categorised according to Perry categories 'A', 'B' and 'C'. The changes in students' perceptions between Levels 1 and 2, Levels 2 and 3, and Levels 1 and 3 were determined and recorded in Appendices 16, 17 and 18, respectively. Summaries of the directions of change in the students' perceptions were provided in Tables 8.5 (Level to Level 2) 1, 8.6 (Level 2 to Level 3) and 8.7 (Level 1 to Level 3). As in Part 1, the degrees of stabilisation, growth and regression were determined on the basis of the numbers of students who underwent these changes, or lack thereof. It was also possible to determine at which level the students did not manage to grow intellectually.

4.4.6 Analysis of the University of Botswana results

4.4.6.1 Part 1 analysis

The same kind of analysis applied to GU results was applied to the UB results, yielding relevant Frequency Tables (Appendix 11), percentage distributions (Tables 7.1a(ii) – 7.1k(ii)), and line distributions (Figure 7.1a(ii) – 7.1k(ii)).

The proportions of students in the different levels were ranked for each questions, and the results recorded in Table 7.2. This was done to help estimate the possible rank-orders for intellectual development in the levels. Chi-square statistics were also calculated to compare the four levels for each question, and the results were recorded in Table 7.3.

4.4.6.2 Part 2 analysis

The UB Part two response categories were also recorded in Appendix 12a - 12f. A summary of these results was provided in Table 7.6. To determine an estimate of how advanced the different levels were in relation to each other, the proportions of Perry 'A', 'B' and 'C' thinkers were ranked for each of the six questions. The number of times each level appeared at each of the four positions (as four levels were compared) on the ranks was then presented in Table 7.7. This would give a bird's eye perspective of where in the ranks each level tended to appear.

4.4.7 Comparison of GU and UB results

The Glasgow University Part 1 distribution Tables and Graphs were exported from Chapter 6 and placed alongside those of the University of Botswana in Chapter 7 for ease of comparison. A chi-square statistic was also calculated to find out how the two populations differed in their perceptions, and the results were recorded in Table 7.4. The necessary conclusions were then also made. The next four chapters will give detailed discussions of the results of the analyses given above.

CHAPTER FIVE

HIGH SCHOOL versus GLASGOW UNIVERSITY LEVEL 1

5.1 Part 1 – Results and Discussion

5.1.1 Distributions of the students amongst the options on the questionnaire scale

In this section, the distributions of High School pupils and GU Level 1 students over the five options on the questionnaire scale will be compared. The percentage and line distributions/graphs for the eleven questions are presented in Tables 5.1a–5.1k and Figures 5.1a–5.1k before the discussion, which gives a general overview on the observed trends. The extent of the difference (if any) between the distributions of the two groups is also determined by means of chi-square statistics.

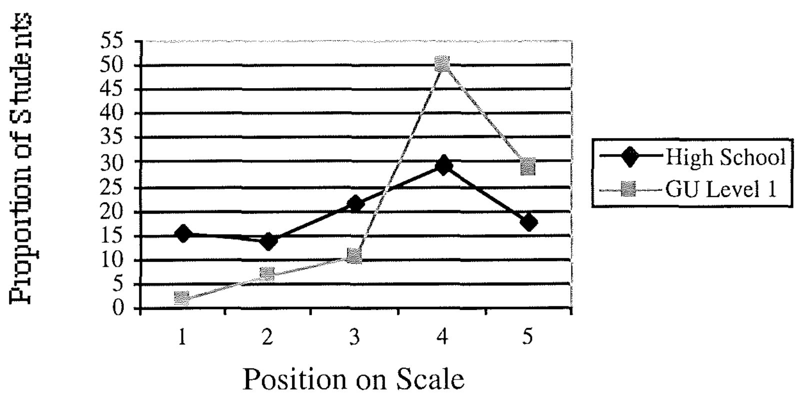
Question 1

'A': In order to pass my course, I need to study just what the teacher/lecturer indicates or tells me. / **'C'**: I do not have to rely totally on the teacher/lecturer. Part of my learning is to work things out myself.

Table 5.1a: Question 1 – Percentage Distributions for High School pupils & GU Level 1 students

Position	High School	GU Level 1
1 (A)	15.69	1.48
2 (A)	13.73	6.94
3 (B)	21.57	10.66
4 (C)	29.41	49.93
5 (C)	17.65	29.10
Blank	1.96	1.77

Figure 5.1a: Q1 - High School vs. GU Level 1 Distributions



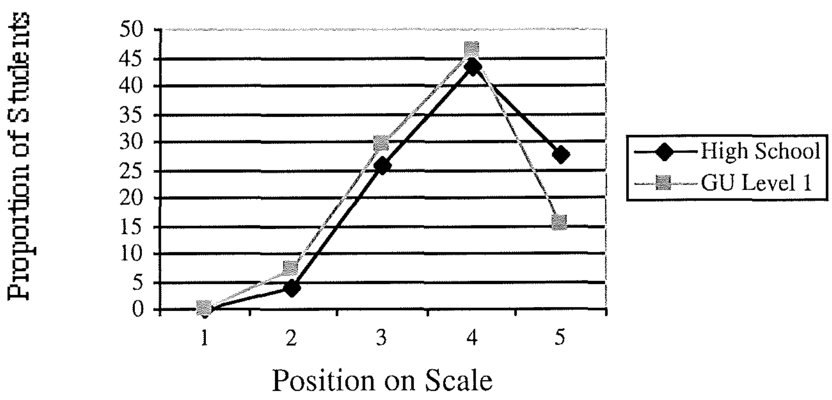
Question 2

'A': I cannot be wrong if I accept what the teacher/lecturer says. If I question anything, I might end up failing. / **'C'**: I do not just believe in just cramming what the teacher/lecturer says without question.

Table 5.1b: Question 2 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	0	0.15
2 (A)	3.92	7.24
3 (B)	25.49	29.69
4 (C)	43.14	46.23
5 (C)	27.45	15.21
Blank	0	1.33

Figure 5.1b: Q2 - High School vs. GU Level 1 Distributions



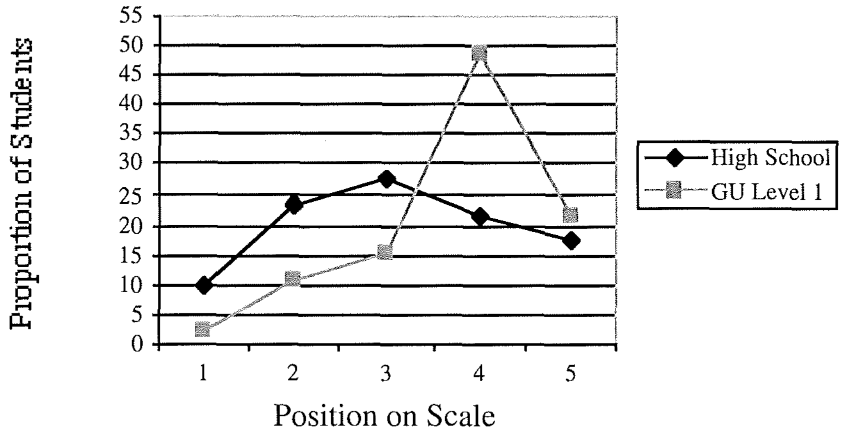
Question 3

'A': I believe it is the job of a teacher/lecturer to supply me with all the knowledge I need. / **'C'**: The duty of the teacher/lecturer is not to teach me everything, but to help me think for myself.

Table 5.1c: Question 3 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	9.8	2.22
2 (A)	23.53	10.78
3 (B)	27.48	15.51
4 (C)	21.57	48.60
5 (C)	17.65	21.57
Blank	0	1.18

Figure 5.1c: Q3 - High School vs. GU Level 1 Distributions



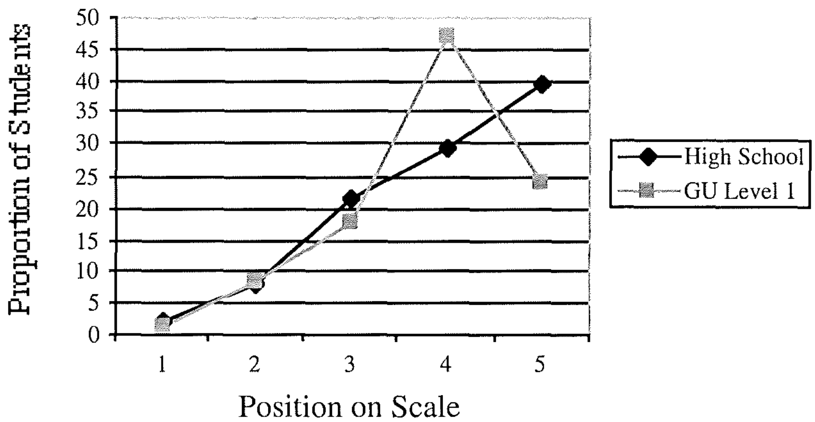
Question 4

'A': A good teacher/lecturer is one who points out to pupils/students which is the one accepted view of an issue. / **'C'**: I think a good teacher/lecturer should give all views on an issue and give his pupils/students a chance to evaluate/weigh them up.

Table 5.1d: Question 4 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	1.96	1.18
2 (A)	7.84	8.42
3 (B)	21.57	17.87
4 (C)	29.41	46.97
5 (C)	39.22	24.08
Blank	0	1.33

Figure 5.1d: Q4 - High School vs. GU Level 1 Distributions



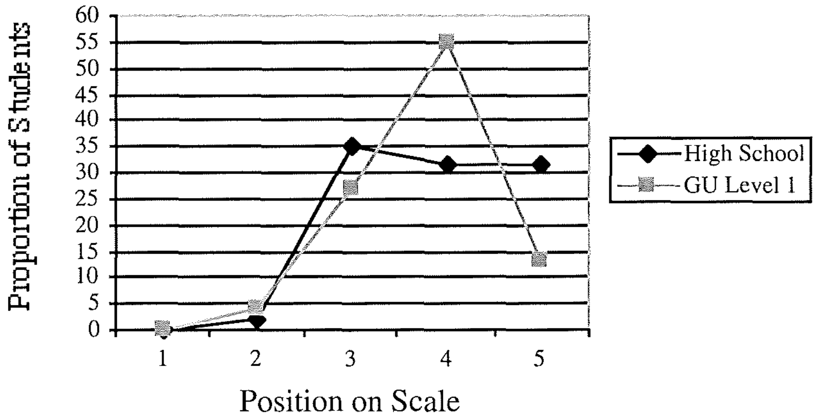
Question 5

'A': I think teachers/lecturers should avoid teaching material that they know pupils/students will find difficult. / **'C'**: Teachers/lecturers should aim to provide challenges to their pupils by introducing difficult topics.

Table 5.1e: Question 5 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	0	0.00
2 (A)	1.96	3.99
3 (B)	35.29	26.88
4 (C)	31.37	54.80
5 (C)	31.37	13.15
Blank	0	1.18

Figure 5.1e: Q5 - High School vs. GU Level 1 Distributions



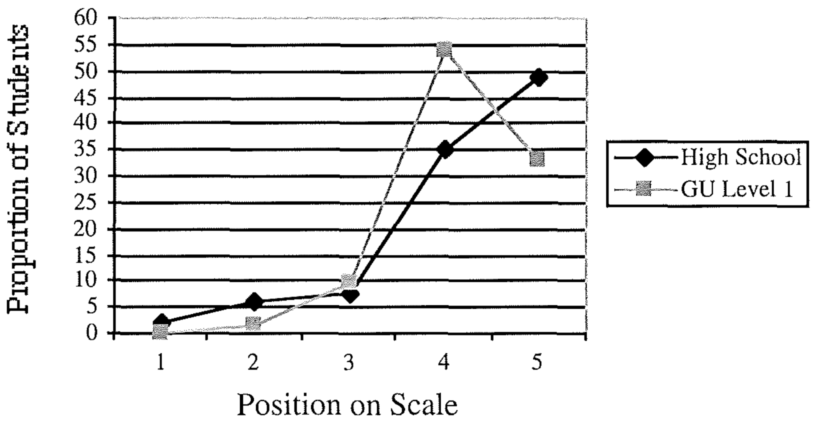
Question 6

'A': I prefer not to work with other pupils/students because then I stand less chance of picking up wrong ideas. / **'C'**: It is good to work with other pupils/students because, by listening to their points of view, I can evaluate/weigh out my own.

Table 5.2e: Question 6 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	1.96	0
2 (A)	5.88	1.77
3 (B)	7.84	9.60
4 (C)	35.29	54.06
5 (C)	49.02	33.09
Blank	0	1.33

Figure 5.1f: Q6 - High School vs. GU Level 1 Distributions



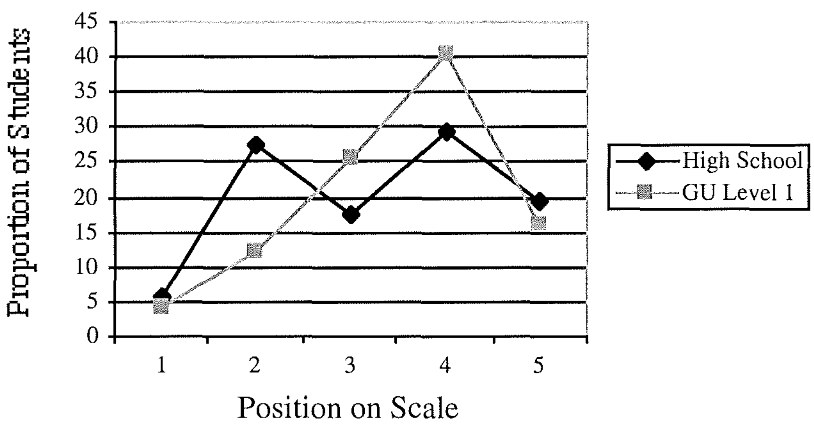
Question 7

'A': All one has to do in science/biology is to memorise things. / **'C'**: Instead of just memorising things, it is more interesting to look for patterns and relationships among facts.

Table 5.1g: Question 7 – Percentage Distributions for High School pupils GU Level 1 students

Position	High School	GU Level 1
1 (A)	5.88	4.14
2 (A)	27.45	12.26
3 (B)	17.65	25.70
4 (C)	29.41	40.32
5 (C)	19.61	15.95
Blank	0	1.48

Figure 5.1g: Q7 - High School vs. GU Level 1 Distributions



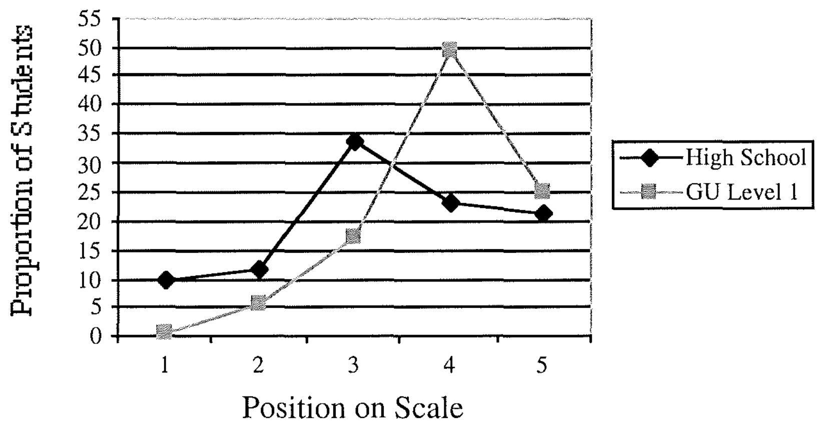
Question 8

'**A**': Science outlines a set of facts about what is happening in the world. A pupil/student need to develop ways of memorising these facts. / '**C**': I do not believe that all scientific facts represent the 'absolute truth'. Pupils/students should try to understand arguments for and against existing knowledge.

Table 5.1h: Question 8 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	9.80	0.44
2 (A)	11.76	5.76
3 (B)	33.33	17.13
4 (C)	23.53	49.48
5 (C)	21.57	25.26
Blank	0	1.77

Figure 5.1h: Q8 - High School vs. GU Level 1 Distributions



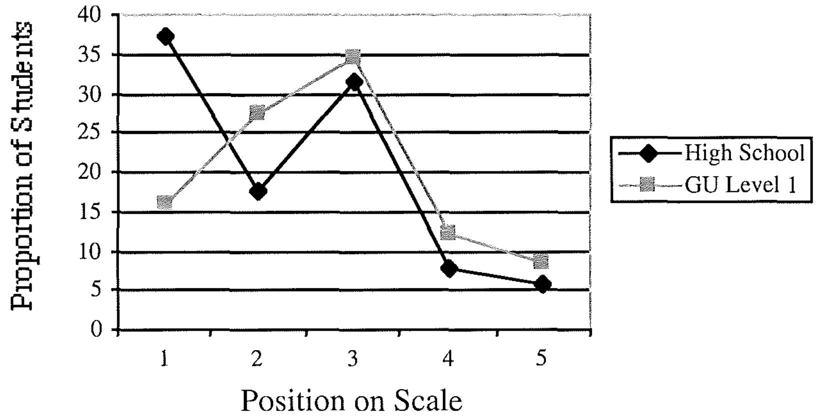
Question 9

'**A**': I prefer to learn the facts and be tested on them in short questions. / '**C**': I do not like short questions as they do not give me the chance (I find short questions quite restrictive as they do not give me the opportunity) to explain what I know and understand

Table 5.1i: Question 9 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	37.25	16.10
2 (A)	17.65	27.33
3 (B)	31.37	34.56
4 (C)	7.84	12.26
5 (C)	5.88	8.42
Blank	0	1.18

Figure 5.1i: Q9 - High School vs. GU Level 1 Distributions



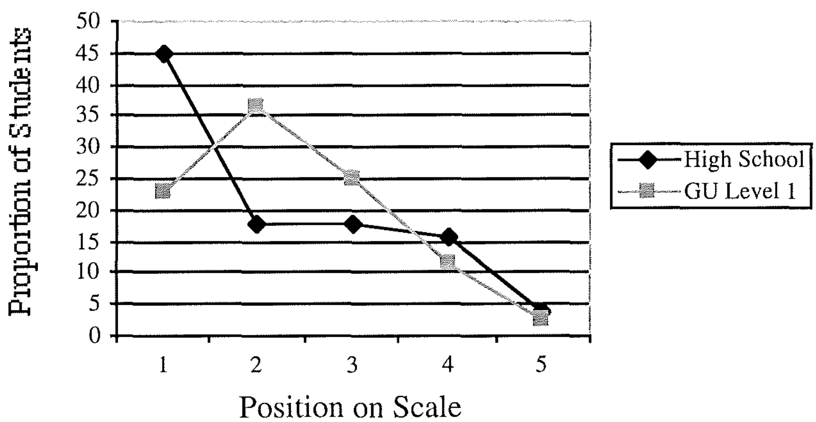
Question 10

'A': In exams I prefer questions which are based on what the teacher/lecturer taught. / **'C'**: In exams, I like questions that give me the scope to go beyond what is taught and show my ability to think (that demand thinking beyond what is taught in class).

Table 5.1j: Question 10 – Percentage Distributions for High School pupils and GU Level 1 students

Position	High School	GU Level 1
1 (A)	45.1	22.90
2 (A)	17.65	36.63
3 (B)	17.65	25.11
4 (C)	15.69	11.52
5 (C)	3.92	2.36
Blank	0	1.33

Figure 5.1j: Q10 - High School vs. GU Level 1 Distributions



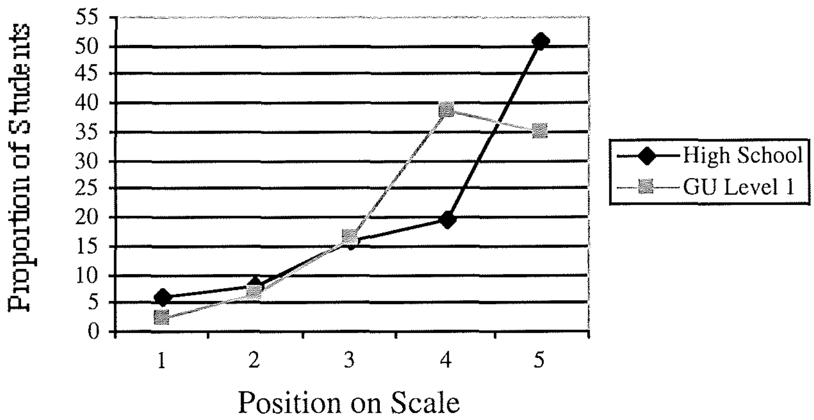
Question 11

'A': In exams, I expect to be rewarded for giving as much information as possible. **'C'**: I believe what should matter in exams is the quality of my answers, not how much I write.

Table 5.1k: Question 11 – Percentage Distributions for High School pupils & GU Level 1 students

Position	High School	GU Level 1
1 (A)	5.88	2.36
2 (A)	7.84	6.35
3 (B)	15.69	16.10
4 (C)	19.61	38.55
5 (C)	50.98	34.86
Blank	0	1.62

Figure 5.1k: Q11 - High School vs. GU Level 1 Distributions



5.1.1.1 Higher proportions of Perry 'C' thinkers at university Level 1 and higher proportions of Perry 'A' thinkers at High School

The distributions show that in all of the questions, with the exception of Q10, there were more university Level 1 students falling under the Perry 'C' positions (positions 4 and 5 in the questionnaire scale) than High School pupils. Conversely, in most of the questions (Q1, 3, 4, 6, 7, 8, 9, 10 and 11), higher percentages of students in the High School group were categorized under the Perry 'A' positions (positions 1 and 2 in the questionnaire scale) than in the university Level 1 group.

These observations do not come up as a surprise since Level 1 students are expected to be more intellectually mature than High School pupils. This difference could be attributed to more than just the chronological age. The nature and culture of education at the two levels differs, obviously. As Perry stated, the Perry 'A' type of thinking, "receives explicit and implicit institutional support" at High school. This support could be said to come in the form of 'teaching' as characterised by delivery of all the material the pupils need to know, with very little or no input at all (in the form of seeking for own information), in some cases, being asked of them. Furthermore, this way of looking at things might be being encouraged by the nature of assessment at schools, which could be providing no challenges to the pupils. It might also be a result of presentation of knowledge to the pupils in a manner that gives them the impression that it is 'Absolute and constant'.

5.1.1.2 Evidence of stronger agreements with statements (either Perry 'A' or 'C') at High School than at university Level 1

It was observed that in all of the 11 questions, higher percentages of students in the Level 1 group went for position 4 of the Perry 'C' category than they did for position 5. This seems to indicate that even though the group, in general, agreed with the Perry 'C' statement, it was not a very strong agreement. For the High School group however, there were some questions (Q 4, 6 and 11) where position 5 dominated position 4, implying strong agreements with the said statements. The tendency for the 'less intellectually mature' individuals to be strongly in agreement with statements denoting their perceptions could be understood from the point of view of how they perceive things in general. As Perry stated, individuals at lower levels of his scheme are more inclined to go for extremes than in-betweens in their perspectives. However, the fact that these 'strong agreements' were not common even at High School could be taken to further support Perry's assertion that today's culture of 'children knowing their rights' does not nurture this way of thinking for much longer. It can then be assumed that indeed pupils are rid of this 'Age of Innocence' even earlier than before, due to changes in the society.

A similar trend in the distributions was observed for the Perry 'A' positions. Where they agreed with a Perry 'A' statement, High School pupils tended to do so strongly, while the university students did so mildly (See Figures 5.1a, 5.1i and 5.1j). Strong agreements with extremes could be indicative of pupils' confidence, either in the system or in selves. Where confidence is highly placed in the system, as in strong agreement with Perry 'A' type of statements, movement to higher positions in the scheme could prove somewhat difficult due to too much dependence on instructors. On the other hand, where too much confidence is placed on the self, this could result in pupils being too self-opinionated to listen to others' suggestions and opinions. It can therefore be assumed that since Level 1 students have had some kind of exposure to the university system already, they should not show as much of this typical Perry 1 position characteristic, compared to High School pupils.

5.1.1.3 Differences in the shapes of the university and High School distributions

It was observed that most of the distributions of these two groups differed. For the Level 1 group, the graphs in almost all of the questions were 'skewed' towards the Perry 'C' position, or towards the Perry 'A' position for questions 9 and 10. In either case, as stated earlier, there is a drop between positions 4 and 5 (more 4s than 5s). The distributions for the High School group did not assume such a shape for most of the questions, however (except for Qs 2, 4, 6, 10 and 11). For most of these, there seemed to be either a 'scatter' of the students amongst the five positions, especially in Questions 1, 5 and 7, or a concentration around position 3 (Q 3), giving an impression of a 'normal distribution'. These distributions are not reported as 'sigmoid' or 'normal' curves in recognition of the fact that they are based on processed ordinal data, but not on raw individual scores.

The 'scatter' observed in some of the High School distributions could be taken to indicate that at this stage, not all the pupils are aware that some responsibilities in the educational process lie with them. They might even be unaware of what goes on in the universities at this stage, or if they are, either just take it that that should be faced when met or be in simple disagreement with it. The most likely reason why they could still be functioning as Perry 'A' type thinkers could be sheer confidence in the system. Those at the Perry 'B' position could be there for reasons explained earlier, i.e. confusion as to whether to assume the responsibility to be soon faced at university or to continue relying on teachers.

5.1.1.4 Evidence of both groups generally agreeing more with Perry 'C' than Perry 'A' statements- except for statements on exam issues

In general, the results indicate that both groups agreed more with the Perry 'C' statements than they did with the Perry 'A' ones. This is in exception of Questions 9 and 10 in which the distributions for the two groups were clearly skewed towards the Perry 'A' positions. This shape was obviously related to the fact that both questions involved issues pertaining to exams. It was obvious that there is something about assessment issues that resulted in the pupils and the students reverting to the Perry 'A' type of thinking. Question 9 was quite interesting in that there were high percentages of the 'B' perspective in both groups (especially for Level 1). The question dealt with the structure of exam questions. It would appear that the two groups preferred short questions requiring straight facts. The occurrence of high percentages of 'B' perceptions here did not come as a shock as Perry did state that these are common where assessment issues are concerned. As with other questions though, the High School distribution showed highest percentages for position 5 in the scale, going in line with what was discussed earlier about the pupils' strong agreements with extremes.

Question 10 dealt with exam content, and it appeared that both groups preferred questions based on what was taught by teachers or lecturers. This could mean that the students and pupils simply preferred this for the sake of convenience or ease of exams, or due to some underlying factors that require further investigation. This will be dealt with in more detail in the next section, where free responses are looked at. At the end of the day, it was evident that exam issues posed more problems that other issues.

5.1.1.5 Chi-square confirmation of observed trends

The results gave an impression that the university Level 1 students might have been more intellectually mature than the High School pupils, as seen from the comparison of the proportions of Perry 'C' thinkers for each question. This difference was tested for significance by use of chi-square statistics, where the distributions of the students among the different options in each question were compared. The results were recorded in Table 5.2 below:

Table 5.2: Chi-square Statistics for the Comparison of Part 1 High school and Glasgow University Level Part 1 Distributions

Question	Chi – square value	Degrees of Freedom	Critical value	Significance Level	High > L1	L1 > High
1	32.431	3	11.34	0.01		*
2	5.0203	2	5.99	0.05	*	
3	25.195	3	11.34	0.01		*
4	0.285	1	3.84	0.05		*
5	16.264	2	9.21	0.01		*
6	7.338	2	5.99	0.05		*
7	10.618	3	9.84	0.02		*
8	25.016	2	9.21	0.01		*
9	14.458	2	9.21	0.01		*
10	16.346	3	11.34	0.01	*	
11	8.253	2	7.82	0.02		*

***Note:** The critical values were adopted from Lewis, 1967.*

The asterisks indicate instances where either the proportion of High School Perry 'C' thinkers was greater than that for university Level 1 students (High > L1), or that for Level 1 students was greater than that for High School pupils (L1 > High). In 5 out of the nine questions where the proportion of Level 1 Perry 'C' thinkers was higher than that for High School pupils (L1 > High; Qs 1, 3, 5, 8 & 9), the difference in the distributions was significant at the 0.01 level. In all these cases we can be 99% sure that this difference did not arise by chance. In two of the remaining questions (Qs 7 and 11), we could be 98%

sure of the significance of this difference, while in the other two (Qs 4 and 6) we could be 95% sure of the significance of the difference. The results corroborate the assumption that the Level 1 students must have been generally more 'intellectually mature' than the High School pupils.

As stated earlier, for Question 10, which dealt with exam content, the distributions suggested that in both groups Perry 'A' thinking was more dominant than either Perry 'B' or 'C' thinking. It was observed that for this question the proportion of High School Perry 'C' thinkers (19.61%) was slightly higher than that for university Level 1 students (13.88%), see Table 5.1j. However, the proportion of High School Perry 'A' thinkers (62.75%) was also slightly higher than that for the university students (59.53 %). In almost all of the other questions, the High school group produced either higher proportions of Perry 'A' or 'B' thinkers, making it the less intellectually mature group. The Level 1 group did not only have the lower proportion of Perry 'C' thinkers in Q10, but also the higher proportion of Perry 'B's. This difference in these distributions was significant at a 0.01 level, giving us a 99% confidence level in the fact that this difference did not arise by chance. It would appear that the exam content issue was a problem at both levels, with confusion being more popular at university Level 1. Though the High School pupils produced a higher Perry 'C' proportion (though less than 20%), the fact that they had a higher Perry 'A' proportion meant that they could not necessarily be said to be more intellectually mature than the Level 1 students.

5.1.2 Observable relationships between distributions

Relationships between the distributions were looked at to find out which questions produced results that appeared to be either similar or opposites. The purpose of this was to provide an insight as to whether the questions might have been inadvertently measuring the same or different things. It was observed that none of the distributions in each of the two groups seemed to be opposed, (except for the exam questions which produced distributions different from the rest of the other questions). The results of the two groups, as discussed above, clearly indicate that the perceptions of these subjects were significantly different, therefore their distributions are looked at separately.

5.1.2.1 High School results

i) Q4: role of teacher - whether to present conflicting views or 'accepted' views only
Q6: role of peers - source of help or confusion/distraction
Q11: view of exams - what to be assessed, quantity or quality

Even though these questions dealt with completely different issues, the distributions were, to a certain extent, similar. They showed the typical agreement with extremes of the Perry 'C' scale that was discussed earlier. It appears, at first glance, that there is no relationship between these issues. However, a closer look reveals that these issues all have an element of the 'amount' of information the pupils could be faced with. Presentation of conflicting views would, for instance, imply presentation of 'many' sides to an issue, thereby bringing in the element of quantity. How question 11 deals with quantity is self-explanatory. In the case of question 6, it can be argued that listening to others also exposes one to a variety of perspectives, or ways of dealing with things. It is pleasing to note that in all these cases, the pupils clearly went for the Perry 'C' statements. As already stated earlier, this could indicate that the pupils were aware of their responsibilities and were willing to take them up. Similarly, they could have just been opting for the more 'responsible perspectives' to impress whoever was to deal with these responses. This problem of the reliability of the data is inevitable when dealing with attitudinal surveys. However, it is unlikely that consistencies in the trends observed could occur, especially where comparative studies are carried out, as observed in this research, if the data was fraught with dishonesties.

ii) Q3: role of teacher – whether to supply all material or stimulate thinking
Q8: view of knowledge - science as realm of 'absolute truths' or not necessarily so

The 'similarity' between questions 3 and 8 goes as far as dominance of position 3 is concerned, and not quite on the shape of the distributions. The distributions are not quite superimposable. Just like in the above scenario, at face value there seems to be no obvious connection between the issues concerned. However, one might argue that since the pupils going for the Perry 'B' position might be confused over the true nature of scientific knowledge, it should make sense that they be confused on how to 'think' about these issues on their own. It would make sense that they find difficulties in selecting the 'right' approaches to the scientific issues.

5.1.2.2 University of Glasgow – Level 1 biology students

i) Q1: roles of students/lecturer - extent of reliance on the lecturer
Q2: role of student - acceptance of lecturer's word without question or questioning it
Q3: role of lecturer – whether to supply all material or stimulate thinking
Q4: role of lecturer - whether to present conflicting views or 'accepted' views only
Q6: role of peers - source of help or confusion/distraction
Q8: view of knowledge - science as realm of 'absolute truths' or not necessarily so
Q11: view of exams - what to be assessed, quantity or quality

The relationship between these questions can easily be recognised. The extent to which students should rely on the lecturer is directly related to how much material the lecturer should present (Qs 1 & 3). In this case, since most students opted for Perry 'C' responses to the items, it can be taken to imply that the students are aware that their thinking is important and should be encouraged, and therefore lecturers should not provide all. It is therefore understandable how these two questions should relate to Q 2, which deals with the issue of questioning the lecturer's word. Since the students are aware that other people's views matter (Q 4 and 6), including theirs, it can then be understood how they can view the lecturer as being open to criticism, like any other person. Question 11 can be seen to fall inline with the others, based on the fact that the students seem to be aware of the value of their own input (2, 3 and 4).

ii) Q 2: role of student - whether to Question the lecturer's word or accept it without question

Q 5: role of lecturer - whether to present challenges in class or not

It cannot be said that the two questions measured the same thing as their themes are very different. However, the similarity in the distributions can be understood from the point of view of recognition of need for input of own views in learning. That being known, the students would see the importance of challenges as a means of encouraging them to put in their own effort. With the knowledge that their views count, they would know not to just accept the lecturer's word without question.

5.1.3 Ranking of the questions according to the Perry positions 'A', 'B' and 'C'

This ranking of questions was done to try and find out which questions seemed to yield the highest proportions of Perry 'A' and 'B', or in other words, to uncover the issues in which the pupils' perceptions indicated lower levels of intellectual maturity.

5.1.3.1 High School Results

The positions on the ranks are labeled 'a' to 'k'. Position 'a' represents the situation where the question either produced the lowest proportions of Perry 'A's or 'B's, or the highest proportion of Perry 'C's; while 'k' represents the worst scenario, where there were the highest proportions of Perry 'A's and 'B's, and the lowest proportions of Perry 'C's.

For the sake of argument, the cut-off point for worst scenarios was placed at 25%. This means that where 25% or more pupils went for either a Perry 'A' or 'B' perception, or 25% or less of the pupils went for the Perry 'C' perspective, the issue at hand was taken to be problematic to the pupils (see proportions of students in **bold** and *italics* - Table 5.3).

The ranks, in increasing order of Perry 'A' and 'B' proportions, and decreasing order of Perry 'C' proportions were found to be as follows:

Table 5.3: Part 1 Question Rankings according to Proportions of Pupils who went for the Different Perry Positions – High School

Rank	**A**			**B**			**C**		
	Q		%	Q		%	Q		%
a	5		1.96	6		7.84	6		84.31
b	2		3.92	11		15.69	2		70.59
c	6		7.84	7		17.65	11		70.59
d	4		9.80	10		17.65	4		63.63
e	11		13.72	1		21.57	5		62.74
f	8		21.56	4		21.57	7		49.32
g	1		***29.42***	2		***25.49***	1		47.06
h	3		***33.33***	3		***27.48***	8		45.10
i	7		***33.33***	9		***31.37***	3		39.22
j	9		***54.90***	8		***33.33***	10		***19.61***
k	10		***62.75***	5		***35.29***	9		***13.72***

- *Position 'A rank-order'*: Questions1, 3, 7, 9 and 10
- *Position 'B 'rank-order*: Questions 2, 3, 9, 8, and 5
- *Position 'C rank-order'*: Questions10 and 9

According to the results, Question 10 produced the highest percentage of Perry 'A' responses (62.75%), followed by Question 9 at 54.90%. This takes us back to the issue of problems with exam structure and content, with over 50% of the pupils having these problems. A much more detailed discussion of the assessment issues is given in Section 5.2.

Questions 7, 3, and 1 all reveal that about a third of the pupils were not too keen on self-reliance, and seemed to believe in memorising all that is given by teachers without questioning or putting in their own effort. The question that produced the highest proportion of Perry 'B' (35.29%) responses was Question 5. It would appear that the pupils were not quite sure of how much challenges should be presented to them by teachers. This could also indicate that the pupils could have been aware that there is need for presentation of challenges, yet they were either not sure of whether they could handle them, or did not know how to do so. Question 8, 9, 3 and 2 also revealed that over 25% of the pupils were confused as to how to approach the knowledge of science, especially on whether to rely on the teachers and memorize what they gave or whether to question what they were given. This, as stated before, could have a lot to do with the way instruction is carried out in schools.

5.1.3.2 GU Level 1 results

The same kind of analysis as described above was applied to the Level 1 results, and Table 5.4 below shows the results.

Table 5.4: Part 1 Question Rankings according to the Proportions of Students who went for the Different Perry Positions- GU Level 1

(a=best/k=worst)

Rank	A			B			C		
	Q		%	Q		%	Q		%
a	6		1.77	6		9.60	6		87.15
b	5		3.99	1		10.66	2		79.03
c	8		6.20	2		10.66	11		79.03
d	2		7.09	3		15.51	4		74.74
e	1		8.42	11		16.10	5		73.41
f	11		8.71	8		17.13	7		71.05
g	4		9.60	4		17.87	1		70.17
h	3		13.0	10		***25.11***	8		67.95
i	7		16.40	7		***25.70***	3		56.27
j	9		***43.43***	5		***26.88***	10		***20.68***
k	10		***59.53***	9		***34.56***	9		***13.88***

As in the High School case, the cut-off point for worst scenarios (high proportions of Perry 'A's or 'B's, and low proportions of Perry 'C's) was placed at 25%. The results were as follows:

- *Position 'A'*: Questions 9 and 10
- *Position 'B'*: Questions 10, 7, 5 and 9
- *Position 'C'*: Questions 9 and 10

It is evident even at this level that the exam issues (Question 9 and 10) are most problematic. Presentation of challenges (Q5), again proved to result in high percentages of position 'B' responses as in the High school case. The results seem to show that Level 1 students were more intellectually developed than the High School pupils. This was indicated by the fact that there were fewer questions in which 25% or more of the Level 1 students opted for Perry 'A' or 'B' responses as compared to the High School pupils.

The results seemed to be reproducible to some extent, in that the questions bearing the problematic issues (Q10, 9 and 5) were detected at both levels. This can be taken to indicate that the questionnaire was consistent at detecting problems, and therefore could be suitable for use as a diagnostic tool in instruction. Its validity in this endeavor can therefore be said to have been proven.

5.1.3.3 Other observations made on these rankings

• Q6 assumed a very good position in the rankings of the questions for both groups in as far as the proportions of Perry A's, B's and C's were concerned:

High School: Perry 'A' = 3rd lowest (7.84%)
Perry 'B' = lowest (7.84%)
Perry 'C' = highest (84.31%)

Level 1: Perry 'A' = lowest (1.77%)
Perry 'B' = lowest (9.6%)
Perry 'C' = highest (87.15%)

This could be seen to imply that both pupils and students, especially the latter, found working with others quite useful. It would, therefore, be beneficial to them if most of the teaching involved collaborative group work.

• Question 1 as well occupied a good position in the Level 1 ranking :

A = 8.42% (5th lowest)
B = 10.66% (2nd lowest)
C = 79.03% (2nd highest)

This could taken to mean that the students were aware of the fact that they have to be responsible for their own learning outwith lecture hours. The lower proportion of Perry 'C' responses (47.06%) in the High School distribution could be seen to indicate that at this level the pupils still need nurturing and classroom teaching. Higher percentages of Perry A' (29.42%) and 'B'(21.57%) responses for the High School group also serve to support this.

5.1.4 Detection of Perry 'B' type thinking

As intended, Part 1 of the questionnaire managed to detect the presence of 'uncertainties' that could well be associated with a Perry 'B' type of thinking. The results were treated further to try and find out the extent of differences in percentages of 'B's at the two levels (Level 1 – High School). The results are shown in Table 5.5 below. A negative difference means there were more 'B's at High School level while a positive difference indicates more 'B's for Level 1:

Table 5.5: Extent of Differences in proportions of High School pupils and Level 1 students assuming a Perry 'B' position

Question	Proportion of High school pupils	Proportion of university Level 1 students	Difference in Proportions (Level 1 – High school)
1	21.57	10.66	-10.91
2	25.49	29.69	4.20
3	27.48	15.51	-11.97
4	21.57	17.87	- 3.70
5	35.29	26.88	- 8.41
6	7.84	9.80	1.76
7	17.65	25.70	8.05
8	33.33	17.13	-16.20
9	31.37	34.56	3.19
10	17.65	25.11	7.46
11	15.69	16.10	0.41

The results show that in 5 out of the 11 questions (Qs 1, 3, 4, 5, and 8), higher proportions of students in the High School group assumed the Perry 'B' position (position 3 in the questionnaire scale), than in the Level 1 group. Higher proportions of High school pupils could be expected to be 'more confused' than Level 1 students especially during the final year of their high schooling. The confusion might possibly be born out of more exposure to or knowledge of 'what goes on at university' while still at High School. The pupils would obviously not know exactly what it is they should be doing, i.e. whether to start behaving like university students and assume more responsibility and independence or continue relying on teachers. This anticipation of responsibility could also result in frustration if the pupils still feel not ready to assume it.

In 6 out of the 11 questions there were higher proportions of 'B's in the Level 1 group than in the High School group. These confusions in the former might have come about as a result of facing multiplicity for the first time and having to struggle with it.

The results show that over a quarter of the university Level 1 students were still confused of what their roles as students were in some of the questions (Qs 2, 5, 7, 9 and10). It was observed that they were even more confused in higher proportions than High School pupils. They seemed to be confused over the following:

Q2 : authenticity of what lecturer says
Q5 : role of lecturer - whether or not to present difficult/challenging material
Q7 : view of knowledge - too much to memorise vs. unit of interrelated facts
Q9 : view of exams - Short questions, acceptable vs. too restrictive
Q10: view of exams - lecture material only vs. further thought and understanding

This shows that it is necessary that the students be told of their right to question material presented by lecturers and that learning is an on-going process for both the lecturer and the students alike. It is also evident that students need to be trained on methods of assessment requiring more than just recall.

5.2 Part 2 – Results and Discussion

Part 1 of the questionnaire could not provide answers as to why the pupils and students went for the different options on the scale, therefore, it was hoped that the free response second part of the questionnaire would give some insights on this. As mentioned in Chapter 4, the responses from the High School group were recorded in Appendix 6 a-f, while those of the Level 1 students were recorded in Appendix 7a-f together with those of the other Levels from Glasgow University.

5.2.1 Distributions of the respondents amongst the Perry positions

Table 5.6 below shows the proportions of respondents in the two groups, going for the different Perry positions for each of the six questions in this section.

5.2.1.1 Important notes on the table

The numbers in brackets indicate percentages of respondents who either agreed or disagreed with the statements without giving a comment, therefore ending up being assigned a position depending on whether the statement was a Perry 'A' or 'C' statement. In the case of no indication of either agreeing or disagreeing without a comment, this was regarded as an indication of either confusion or neutrality, hence qualifying as a Perry 'B' position.

It also has to be noted that the total percentages for the positions in Table 5 may not necessarily be the exact summations of the categories in Appendixes 6 and 7 since in some cases the respondents gave more than one statement. This was taken into consideration when creating the table above, so that one individual was not counted more than once.

In some cases, the respondents appeared to have misconstrued the questions, as Appendixes 6 and 7 show, and this was also indicated in the above table. For Question 6, there statements which could qualify as either Perry 'A' or 'C' statements, depending on how they were looked at, and so to avoid unnecessary errors, they were put in the special category of 'either Perry A or C' as appropriate.

Table 5.6: Percentages of respondents giving the different Perry categories in their responses

Question / Group	Position 'A'	Position 'B'	Position 'C'	Other categories
Question 1				
High School	25.49 + (5.88) = 31.37	15.69 + (7.84) = 23.53	39.22 + (5.88) = 45.10	
Level 1	19.50 + (3.69) = 23.19	17.28 + (1.18) = 18.46	58.05 + (0.30) = 58.35	
Question 2				
High School	7.84 + (1.96) = 9.80	1.96 + (1.96) = 3.92	58.86 + (17.65)=74.51	11.76(Q misconstrued)
Level 1	9.60 + (1.33) = 10.93	10.64 + (3.25) = 13.89	59.68 + (4.87) = 64.55	10.64(Q misconstrued)
Question 3				
High School	1.96 + (1.96) = 3.92	0.00 (1.96) = 1.96	68.63 + (21.57)=90.20	3.92 (Q misconstrued)
Level 1	2.36 + (0.44) = 2.80	7.24 + (2.81) = 10.05	80.80 + (5.32) = 86.12	1.03 (Q misconstrued)
Question 4				
High School	31.37 + (5.88) = 37.25	9.80 + (3.92) = 13.73	35.30 + (11.76)=47.06	1.96 (Q misconstrued)
Level 1	6.94 + (0.59) = 7.53	13.44 + (2.66) = 16.10	69.57 + (6.65) = 76.22	0.15 (Q misconstrued)
Question 5				
High School	33.33 + (13.73)=47.06	15.69 + (3.92) = 19.61	21.57 + (5.88) = 27.45	5.88 (Q misconstrued)
Level 1	6.65 + (3.54) = 10.19	37.22 + (3.40) = 40.62	38.40 + (3.54) = 41.94	7.24 (Q misconstrued)
Question 6				
High School	6.45 + (9.68) = 16.13	16.13 + (0.00) = 16.13	12.90 + (25.81)=38.71	29.03 (either A or C)
Level 1	3.84 + (1.03) = 4.87	11.67 + (5.32) = 16.99	35.04 + (4.58) = 40.62	37.52 (either A or C)

One more thing to note is that for Question 6, the results are based on the question that appeared on the original questionnaire before it was modified, which read 'I am very confident that I will pass this course'. All the Level 1 students responded to this question, whereas only 31 out of the 51 pupils in the High school group responded to it. The rest responded to the question that appears in the final version of the questionnaire reading 'I am very confident in myself and like saying my opinions and views in class, discussions, labs, etc.'. It only made sense that the results from the first question be used in this case as it was common to at least some of the High school respondents and the Level 1 group.

5.2.2 Noticeable trends in the results

In general, the results showed that there were higher percentages for Perry 'C' responses as compared to both Perry 'A' or 'B' responses in both the two groups. This was the case for all the questions, except one instance in Question 5, where there was a higher percentage of Perry 'A' responses than Perry 'C's, in the High School group. These differences were clearly evident in Questions 2, 3, 4(for level 1 only), and 6, which satisfied the cut-off point of 25% used in Section 5.1. This carries the implication that in both groups, the respondents were generally functioning at a higher level in the Perry scheme in most aspects of their learning.

The lowest percentages of Perry 'C' responses were recorded in Question 5, for both groups. What these results imply is that Question 5 was the most problematic as it is here that the respondents operated at lower levels than they normally do. This came as no surprise, however, as the question dealt with assessment.

• *Q5: "Exams should be confined only to what was taught."*

	Agree('A')	'B'	Disagree ('C')
High School:	47.06%	19.61%	27.45%
Level 1:	10.19%	40.62%	41.94%

This supports the findings of Part 1 (Section 5.1), which showed that the lowest Perry 'C' proportions and highest Perry 'A' proportions of the subjects (at both High School and university Level 1) were recorded where assessments issues were concerned. Both pupils and students seemed to echo the same reasons and concerns, as seen from the synopsis below, extracted from both Appendixes 6e and 7e:

- It would be easier to do the exam.
- There is no time to do extra work, pupils/students have too much to handle in other courses/subjects.
- This would make sure there are fewer ugly surprises.
- It would be unfair to those without the resources.
- It would be difficult to know how much extra knowledge to learn, may waste a lot of time where it is not needed.
- Students are not clairvoyant - shouldn't be expected to guess. If no fair indication is given as to what extra to learn, then it's unfair. Students should know exactly what they are expected to reproduce in an exam.
- There would be competition, and that is unfair for those without extra knowledge.
- There is too much 'out there' to know what to learn on one's own.
- Students may not enjoy reading extra stuff that they don't find interesting.
- Exams are scary enough as it is, some people suffer from blackouts even though they know their stuff.
- There have been clear instructions given that nothing beyond lectures and textbook is sought.
- Currently exams are based on lectures only.
- If you don't need to know extra work then why bother.

Many deductions could be made from the various comments above. Some of the statements could be said to indicate that the type of thinking related to the approach to exams (as opposed to other issues related to learning) could be partly linked to the anticipated ease implicit in learning only a limited amount of material from lectures or classes.

Another interesting observation is that students tend to think it is *'unfair'* to be asked to do extra work. It appears that they do not believe that it is part of their course and therefore feel that whoever does it, does it out of their own will; as a result those who do not do it should not be penalised. There is the implication that to them the *'course'* refers only to that which is learnt in the lecture/class room. This calls for clarification to freshmen as early as possible because it might be because of this misunderstanding that they adopt this attitude to exams. It is clear that they are aware that there is material to be learnt beyond the lecture, but feel that there is no need to bother with it, so as to minimise hassles and headaches.

The other revelation coming out of these responses is that students seem not to know what comprises extra knowledge and to what depth this should be covered. This is evident from laments like *"Students are not clairvoyant..."; "There would be differences in what students learn beyond lecture..."; "There is too much out there to know what to learn..."*, and so on. This again could be indicative of poor communication between the staff and the students.

Indeed there is a vast amount of information sources the students could approach for extra knowledge, but unless proper guidelines and references, or even tips on to how to look for the essential information are given, sending them *'out there'* is like sending them into a maze. Chances are only a few are dedicated enough to face the trouble of doing so, and even then, only a small percentage of these would see to the completion of the job. The majority give up somewhere along the way with the attitude *"If you don't need to know extra work, then why bother..."* (see last comment).

The fact that some students feel they may not have the resources others have, could simply be a sign that they are not effectively made aware of what is available to them. The issue of students *"...not enjoying reading extra stuff they do not find interesting."* is a purely philosophical one. Philosophers of education have argued before about how lecturers/teachers can teach material students/pupils find uninteresting in a way that could spark interest without imposing their own values on them. For the purpose of the current issue, it could be argued that if the extra information is related to the lecture material, this in itself might spark the interest. It could be the material that is found uninteresting is either unrelated to the course or belongs to a higher level of treatment. It is therefore always important to clearly specify what comprises extra knowledge.

There were some claims that *"...there have been clear instructions given that nothing beyond lectures and textbook is sought..."* and that *"...currently exams are based on lectures only..."*. If true, these factors do not help much in the intellectual development of students. They certainly imply that students would not anticipate any challenges, which, according to Perry, are essential for the advancement of students from lower to higher levels of intellectual thought and for preparing them for dealing with higher order problems.

A marked difference between pupils and students is also observed here, In 5 out of 6 questions (Qs 1, 3, 4, 5, and 6), higher percentages of Perry 'A' type responses were recorded in the High School group compared to the Level 1 group. This finding might seem to support what has already been stated in 5.1 above, that pupils are not as intellectually mature as, and therefore need more teaching than students who seem to be more aware of their responsibilities. This deduction is further supported by the fact that in 4 out of 6 questions (Qs 1, 4, 5, and 6), higher percentages of Perry 'C' responses were recorded in the Level 1 group compared to the High School group.

An interesting trend was observed when the Perry 'B' responses were looked at. The observation made earlier in Section 5.1.4, where in 6 out of 11 questions higher percentages of Perry 'B' responses were recorded for the Level 1 group compared to the High School group became much clearer here. This was now the case in 5 out of 6 questions (Qs 2, 3, 4, 5 and 6). The difference in question 6 was not that much marked. However, this finding seems to imply that the free response category of the questionnaire was more effective at exposing the Perry 'B' type of thinking than the first part. This shows the effectiveness of the tool at doing what it was intended to do. The fact that a similar trend of results, even though quantitatively dissimilar, was observed, serves to support this.

What this implies is that more Level 1 students seemed to be more confused over issues pertaining to their learning than their High School counterparts. This state of affairs might have been brought about by the fact the Level 1 students had already experienced the need for responsibility in a highly multiplistic system. They might have been unsure of how to handle multiple perspectives, while the High School pupils might have either had a lot of confidence in themselves or simply stated what they anticipated would be expected of them soon at college. The results obtained in Question 6, which read "I am very confident I will pass this course", however indicate that self-confidence could not possibly have been the main reason, as the pupils recorded higher percentages for 'A' responses than Level 1 students.

The results obtained for Question 1 were also interesting in that there seemed to be the highest degree of scatter of respondents among the three positions in both groups here than in any other question, except for Question 5. This scatter clearly indicated divided feeling amongst members of each group on the issue. The question read, "Pupils/students should be able to get a good grade by just absorbing the information they get from class/lectures and giving it back in tests and exams". It was interesting to note that this question too, like Question 5, made some reference to assessment. Compared to Question 5 however, higher percentages of Perry 'C' responses were recorded for both groups here. It could be assumed that while some the respondents felt that it would not be good for them to get good grades from just relying on lecturers or teachers, they however did not feel comfortable when faced with questions from material outwith lectures.

A similarly interesting observation made was that in some cases, where comments were sought (as in Part 2 of the questionnaire), the percentages of Perry 'A's decreased while Perry 'C's increased as compared to responses to questions in Part A which sought no comments, still in the exam questions. A good example is a comparison between Q10 (PartA) and Q1(Part B) which were almost the same:

Q10 (Part A): "In exams I prefer straightforward questions based on what the teacher/lecturer taught." vs. " I like exam questions which demand thinking beyond just what is taught in class."
Q1 (PartB): "Pupils/students should pass easily if they just work hard at cramming the information they get from teachers/lecturers and give it back in tests and exams."

	High School		**Level 1**	
	A	C	A	C
Q10(Part 1)	62.75%	19.61%	59.53%	13.88%
Q1(Part 2)	31.37%	45.10%	23.19%	58.35%

This might be due to the pupils'/students' knowledge of the importance of doing extra work in improving achievement. This seems to be inline with the observation and deduction made above in comparison of Questions 1 and 5. Question 10 referred to "preference of questions based on class-work only", which could indeed make life easier, whereas Question1 questioned whether presentation of this 'class-work' only in exams should provide an easy pass. Even though they might have agreed that passing should be possible with presentation of class-work only, their comments showed that they are aware of the need for further studies, as the synopsis below, taken from Appendix 6a :

- The knowledge required for passing should be given entirely by the lecturer. Excelling, however, should be off the students own back.
- Students will pass easily if they memorise (x100). A more creative, less linear exam procedure might broaden the mental horizon of graduates (if that's what you want).
- This is true but you only pass. To obtain high grades extra work is required o build on the basics taught.
- They should pass, maybe not particularly well though. Lecturer should give all the basic facts needed to pass exams. Up to students if they find out more.
- The exams are based on the lectures, so if all the information is absorbed you pass, but if you want to get an excellent result the student should do work on their own.

• I know that this question is posed to get us to write that we need to really think for ourselves, but the main basis of this should be taught material (plus labs).

These kinds of responses give hope because even though the respondents may well agree with Perry 'A' statements, it is evident that they are aware of and are capable of functioning at higher levels. However, as already stated earlier, the types of exams they are made to sit may as well be a reason why they approach exams with this type of attitude. The statements below serve to support this :

• Because the majority of questions asked in the last exams were on coursework and lecturers never specify that extra knowledge is required.
• For the most part exams rarely test the student on work that is different in any major way from that taught.
• The exams seem to be based mainly on what was taught in lectures.
• This is what they ask for in exams.
• Most exams are based on what lecturers say or tell you. Therefore I believe that the above statement is justified.
• As biology is very much a test of memory.
• As the exams are fact-based i.e. multiple-choice.
• The exam is largely multiple-choice based and therefore, opinion, etc., are redundant in that format.
• With the current system, yes, that is all that is required. Perhaps that is all that is needed at this level.

It can, therefore, be assumed that the students do not see the need to work any further than what they do in lectures. What is lacking at this moment, it would appear, is the challenge that is necessary for prompting them to develop any higher in their intellectual capabilities. They seem to lack the necessary motivation.

On the other hand, there were responses that could be said to indicate genuine 'A'-type thinking. Examples are given below:

• The information given in lectures is correct, and if a question is asked about information covered in a lecture, the answer should be correct if you give back answers from the lecture.
• Hard work should be rewarded.
• The more you study and read up on notes, the more information is absorbed and you have an increased chance of good results.
• The lecturers are there to teach the course, i.e., what you need.
• The information from lectures should be enough to pass easily.
• What is learnt in lectures should be what's taught in the exam.
• All students should pass if a high level of study is maintained.
• If the exams are made up by the lecturers then they will ask about what they have taught.
• The information in lectures should be used to decide if students pass or fail.
• Because to understand the subject you have o learn course facts (Sec).
• Most of the work assessed in the exams should be covered by teacher. This is fair.(Sec).
• The only way to learn something is to memorise it and if you don't know the facts, then you can't expect to pass the exam.

It is this group who need urgent attention. If at this level, end of Level 1 at university, they still believe in 'the lecturer as the only true and infallible source of information', then it is quite clear they have to be re-oriented as to what university education is all about. The only comforting news is that only a minority of the group seemed to need this.

5.2.3 A chi-square treatment of Part 2 results

The raw frequencies obtained from this part of the questionnaire were subjected to a chi-square test, to find out if the differences observed between the two groups were significant. The results were recorded in Table 5.7 below. A cross in the 'Significant?' column indicates that the difference was significant.

Table 5.7: Chi-square results for the comparison of High School and Level 1 Distributions (Part 2)

Question	Chi- square value	Degrees of freedom	Critical value	Significance Level	Signifi-cant?
1	3.432	2	5.99	0.05	-
2	4.471	3	7.82	0.05	-
3	2.126	1	3.84	0.05	-
4	11.815	1	6.64	0.01	x
5	58.055	2	9.21	0.01	x
6	2.037	2	5.99	0.05	-

Questions 4 and 5 were the only questions in which the differences between the two groups proved significant. In both cases, we can be 99% confident that the results did not arise by chance alone. In both cases the High School group had higher proportions of Perry 'A' and lower proportions of Perry 'C' statements than the university Level 1 group. The Level 1 group produced more 'B' statements than the High School group. The results are re-presented in Table 5.8 below for ease of reference:

Table 5.8: Comparison of proportions of High School pupils and university Level 1 students giving Perry 'A', 'B' and statements 'C' in Qs 4 and 5 of Part 2

	Perry position 'A'	Perry position 'B'	Perry position 'C'
Question 4			
High School	37.25	13.73	47.06
Level 1	7.53	16.10	76.22
Question 5			
High School	47.06	19.61	27.45
Level 1	10.19	40.62	41.94

Even though these were the only cases where the differences were significant, the results further prove that at least in some respects, the Level 1 students were more intellectually mature than the High School pupils were.

On the other hand, it can be said that the lack of significance in the differences between most of these questions could carry an implication that Level 1 students are not that different from final year High School pupils in their thinking. This would make sense considering that Perry did state that transition from one level in the scheme to another is a gradual process. Since the results did show, superficially, that the Level 1 students appeared more mature, it can also be assumed that they were in transition between a lower operational level that the High School pupils were at, and a more advanced level.

At the end of the day, all these results indicate that Perry's 'theory' does apply to these two groups, and that the questionnaire was quite effective in uncovering these differences.

CHAPTER SIX

COMPARISON OF STUDENTS IN THE DIFFERENT LEVELS OF UNDERGRADUATE BIOLOGY COURSES AT THE UNIVERSITY OF GLASGOW

6.1 Introduction

The previous chapter gave an idea as to how the perceptions of First Year university students compared with those of pupils in their final year at High School. It was found that in general, the university students were slightly more intellectually mature, according to the Perry scheme, than the pupils. In this chapter, similar comparisons will be made between students in the different levels of undergraduate biology courses. This will give an indication of whether the students manage to 'grow' as they progress through their courses.

It was also observed, in the previous chapter, that the High School and university Level 1 groups seemed, generally, to have Perry 'C' types of perceptions where their roles as pupils/students, roles of teachers/lecturers, roles of peers and view of knowledge were concerned. However, both groups proved to have more of the Perry 'A' perceptions in the case of assessment issues. This observation was also investigated in this chapter.

As in the previous chapter, the results obtained from Part 1 and Part 2 of the questionnaire will be treated separately in Sections 6.1 and 6.2 respectively. In this chapter, however, much more attention is given to the individual questions, instead of just looking for general trends in results as in the previous chapter.

Most importantly, the nature of the results obtained served a good purpose in indicating how effective the questionnaire was in picking out the differences between the students. Any problem areas were also noted with the aim of rectifying them for future use of the questionnaire.

6.2 Part 1 of Questionnaire – Results and Discussion

6.2.1 Item-by-item analysis

The raw frequencies obtained from this part of the questionnaire were recorded in Appendix 5. These frequencies were then converted to percentages for the purpose of drawing line distributions to compare the distributions for the different levels (with varying sample sizes). Tables 6.1 a-k show these percentage distributions and the corresponding line distributions or graphs are shown in Figures 6.1 a-k. It should be noted that the polarities in the questions were corrected to make sure that Perry 'A' positions were positions 1 and 2, Perry 'B' was position 3, and the Perry 'C' positions were positions 4 and 5 on the scale. The results for the Staff group are given along with student results for the purpose of comparison later in Section 6.3. However, the students' results will be looked at first, with reference to the staff results only where it is very necessary. The questions will be discussed in numerical order.

Question 1

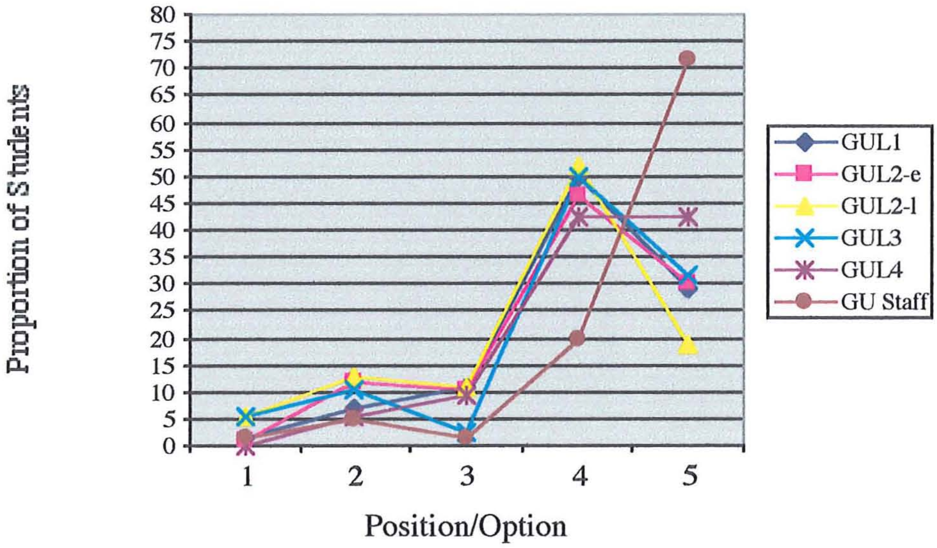
'A': In order to pass my course, I need to study just what the lecturer indicates or tells me. / **'C'**: I do not have to rely totally on the lecturer. Part of my learning is to work things out myself.

Table 6.1a: Question 1 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	1.48	1.02	5.56	5.26	0	1.67
2(A)	6.94	11.73	12.96	10.53	5.56	5
3(B)	10.66	10.2	11.11	2.63	9.26	1.67
4(C)	49.93	46.43	51.85	50	42.59	20
5(C)	29.1	30.1	18.52	31.58	42.59	71.67

The letters next to the positions on the scale indicate the Perry positions to which the questionnaire scale positions are equivalent. The column 'acronyms' stand for the following: GUL1 (Glasgow University Level 1); GUL2-e (Glasgow University Early Level 2); GUL2-l (Glasgow University Late Level 2); GUL3 (Glasgow University Level 3); and GUL4 (Glasgow University Level 4).

Figure 6.1a: Part 1 Question 1 - Distributions of Students over the Different Questionnaire Scale Options



The distributions above clearly show that higher percentages of the students had Perry 'C' than either of Perry 'A' or 'B' types of perceptions. This seemed to indicate that, in general, the students were aware of and appreciated their responsibilities for their own learning. This could also be taken to be an indication of the possibility that the students were aware that other sources are as legitimate as their lecturers are and need to be consulted.

It could also be observed that at all levels, more students opted for the less extreme position 4 than for position 5, except for Level 4 students, who were equally distributed between these two options. This could be taken to indicate that the Level 4 students were more confident in assuming responsibility for their learning than the lower levels. It was also found that no Level 4 students opted for the Perry 'A' statement. This observation seemed to further support the idea that Level 4 students were more intellectually mature than the others.

The proportion of students who opted for the Perry 'A' statement was lowest at Level 1, according to table 6.1a. This could be taken to indicate that this group had high levels of confidence in their own responsibility as learners, more than they wanted to rely on the system. This observation goes in line with that made in Chapter 5, where the High School pupils seemed to be more confident than the 'more mature' Level 1 students. A similar kind of argument could be made here that this could possibly be a result of the higher levels having experienced implications of responsibility more than the lower Level 1 group, and thereby feeling less comfortable with the situation.

The fact that the late Level 2 had the Lowest Perry 'C' proportion and the highest Perry 'A' and 'B' proportions was quite peculiar. This could mean that there might have been something going on at around that time that might have caused this drop in the students' perceptions. It was therefore important to check if this was the case with the other questions before any further conclusions could be made on this issue.

Question 2

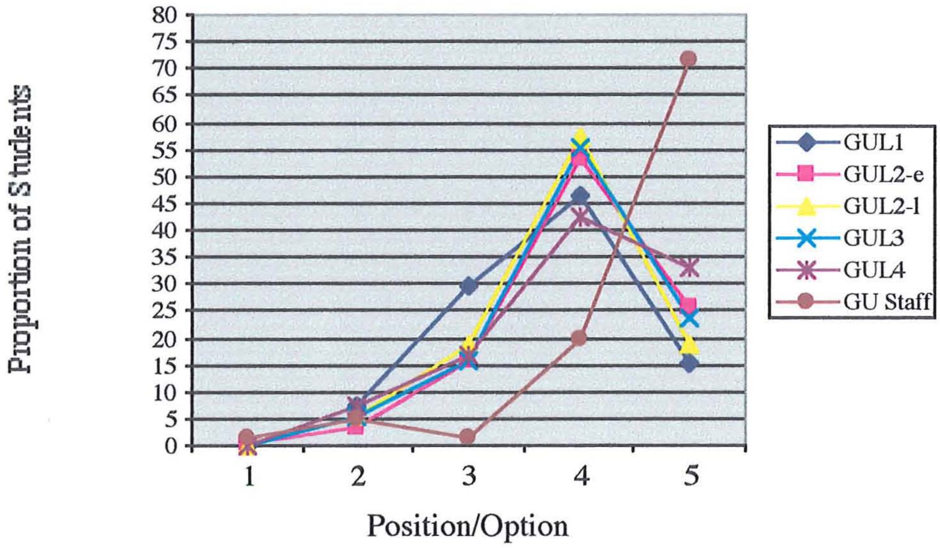
'A' - I cannot be wrong if I accept what the lecturer says. If I question anything, I might end up failing. / **'C'** – I do not believe in just cramming what the lecturer says without question.

Table 6.1b: Question 2 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	0.15	0.51	0	0	0	1.67
2(A)	7.24	3.37	5.56	5.26	7.41	5
3(B)	29.69	15.82	18.52	15.79	16.67	1.67
4(C)	46.23	53.47	57.41	55.26	42.59	20
5(C)	15.21	25.51	18.52	23.68	33.33	71.67

As with the first question, there were more Perry 'C' responses than those of either Perry 'A' or 'B' positions. However, it appeared like there had been a bit of reduction in the proportions of Perry 'A' and 'C' positions and a slight increase in the Perry 'B' proportions for all the levels. Though one could see the reduction of Perry 'A' proportions as something positive, the fact that the Perry 'B' proportions were higher compared to those in Question 1 caused concern. This meant more students were confused as to whether they could be right or wrong in questioning the lecturer's word. It was noted though, that these proportions did not reach the 25% cut-off point introduced in Chapter 5, for all the other levels apart from Level 1, where it went as high as 29.69%.

Figure 6.1b: Part 1 Question 2 - Distributions of Students over the Different Questionnaire Scale Options



In this question, Level 1 even registered the lowest proportion of Perry 'C's. This carried a further implication that even though the Level 1 students might be sure of their responsibilities in their learning, to some extent they still felt the final word comes from the lecturer. Level 4 students chose option 5 in the Perry 'C' position in higher proportions than students in the other levels did, which suggests that they might have been more intellectually mature than the others.

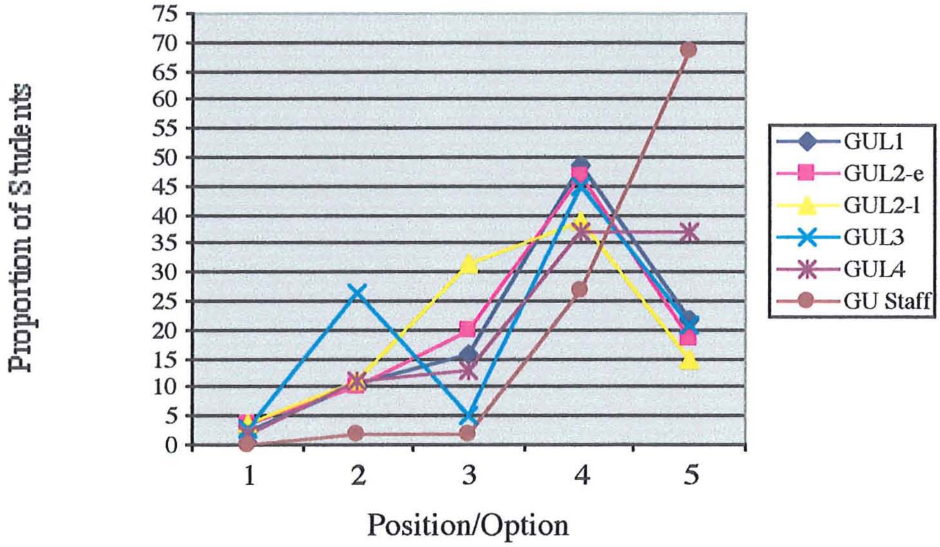
Question 3

'A' – I believe it is the job of the lecturer to supply me with all the knowledge I need. / **'C'** – The duty of the lecturer is not to teach me everything, but to help me think for myself.

Table 6.1c: Question 3 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-I	GUL3	GUL4	Staff
1(A)	2.22	3.57	3.7	2.63	1.85	0
2(A)	10.78	10.2	11.11	26.32	11.11	1.67
3(B)	15.51	19.89	31.48	5.26	12.96	1.67
4(C)	48.60	46.94	38.89	44.74	37.04	26.67
5(C)	21.57	18.37	14.81	21.05	37.07	68.33

Figure 6.1c: Part 1 Question 3 - Distributions of Students over the Different Questionnaire Scale Options



Question 3 as well produced results almost similar to those from Questions 1 and 2. There were higher Perry 'C' proportions than Perry 'A' and 'B' in all the groups. Higher proportions of students also went for option 4 instead of 5 in all the groups, except for Level 4. Almost like in Question 1, the C responses for this level were just about equally distributed between these two options. This observation was not surprising considering that both Question 1 and 3 give reference to the extent of independence the students have to be involved in and that to which the lecturers should be relied on.

However, higher proportions of responses were recorded for positions 2 and 3 in the scale than in Question 1, in general. This could be indicative of the possibility that the students feel more insecure in presenting their own thoughts than in just doing independent work. The highest proportion of Perry 'B's was recorded for late Level 2 (31.48%), once again indicating that this group were the most confused in the aspect of the extent of their reliance on the lecturer.

For Level 3, over 25% of the respondents (26.32%) went for position 2 in the scale. This was the only case in this question where the proportion of respondents was beyond the 25% cut-off point. This could also be taken to indicate that the Level 3 students had problems with engaging in independent thinking, and therefore preferred to be supplied with thoughts by lecturers.

The fact that the trends in the results seemed to be reproducible in yet another question could not be ignored. It had become apparent that something definitely took place at late level 2 that caused this 'retreat' in perceptual development of the students. It could not be argued that the problem could be due the group itself because these students were a subset of both the early Level 2 and Level 1 groups. This observation obviously needed to be looked into further.

Question 4

'A' – A good lecturer is one who points out to students which is the one accepted view of an issue. / **'C'** - I think a good lecturer should give all views on an issue and give students a chance to evaluate it.

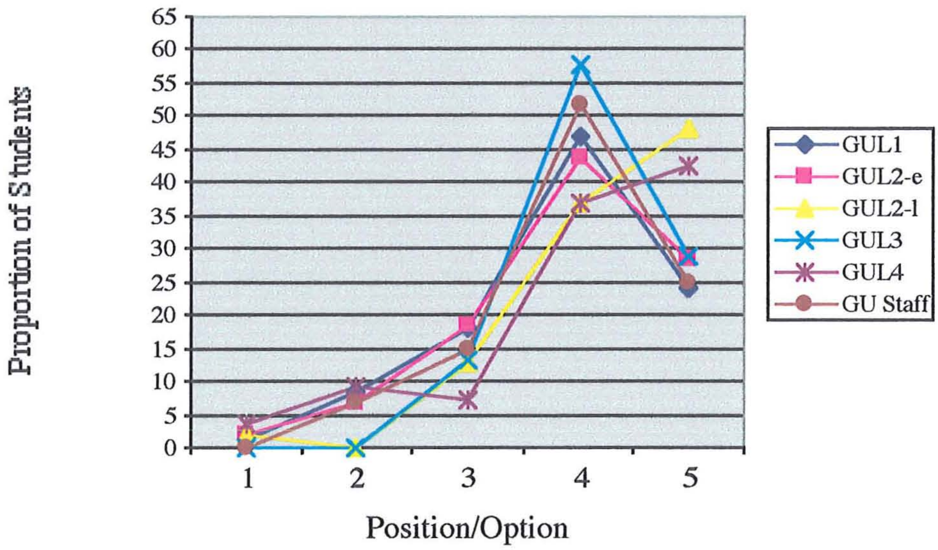
Table 6.1d: Question 4 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	1.18	2.04	1.85	0	3.7	0
2(A)	8.42	6.63	0	0	9.26	6.67
3(B)	17.87	18.37	12.96	13.16	7.41	15
4(C)	46.97	43.88	37.04	57.89	37.04	51.67
5(C)	24.08	28.57	48.15	28.95	42.59	25

Higher proportions of students went for the Perry 'C' position than for either Perry 'A' or 'B'. The Perry 'A' proportions were extremely minimal, all below 10%. This seemed to suggest that the students were most aware of the existence of multiplicity in knowledge. It could also be concluded that they were willing to face challenges of weighing out different views without too much reliance on lecturers. Though slightly more popular than the Perry 'A' perspectives, the Perry 'B' responses did not register up to the 25% cut-off point, but they were all below 20%.

The distributions in Question 4 did not differ too much from those in Question 2, except for the high proportion of Perry 'B' responses recorded for Level 1 in the latter. This similarity might have stemmed from the fact that both questions deal with the issue of presentation of views by lecturers. The students could be said to be aware that their views count, and that they as well could possess legitimate knowledge.

Figure 6.1d: Part 1 Question 4 - Distributions of Students over the Different Questionnaire Scale Options



The results of question 4 were interesting in that the trend in the ranking of the Mean positions that was observed in the previous questions did not apply here. The late Level 2 group produced the second highest total proportion of Perry 'C' responses. This group also produced the highest proportion of position 5 on the scale, indicating a strong agreement with the Perry 'C' statement. Level 4, also failed to produce the highest proportion of Perry 'C' responses.

The change observed for the late Level 2 group was worth having a look at. It was interesting to try and figure out what was happening at this time in the students' courses that might have resulted in this. The results obviously showed that at late Level 2, the students sought more freedom in weighing up views than the other groups. One wonders if there is a situation at this level that makes the students more aware of the need for this freedom, which then either disappears or becomes less appreciated once they have gone past this level. Obviously this would need more probing or investigation, but one could also speculate that the students might have felt that they were being deprived of this freedom in some way. However, this still fails to explain why it would change after this level, in a negative direction. Obviously these questions could not be adequately addressed on the basis of the results obtained from this question, and would hopefully be illuminated by findings from the second part of the questionnaire.

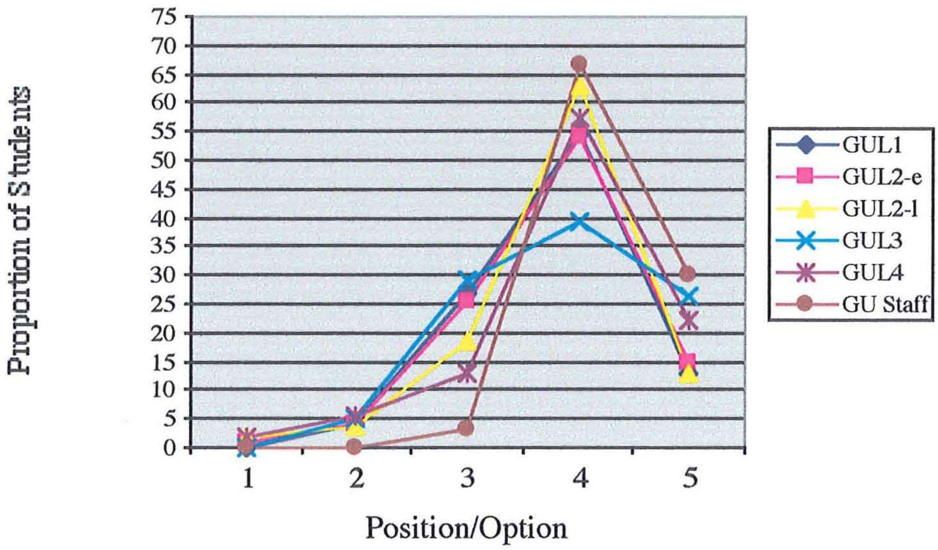
Question 5

'A' – I think lecturers should avoid teaching material that they know students will find difficult. / 'C' – Lecturers should aim to provide challenges to their pupils by introducing difficult topics.

Table 6.1e: Question 5 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	0	1.02	1.85	0	1.85	0
2(A)	3.99	4.08	3.7	5.26	5.56	0
3(B)	26.88	25.51	18.52	28.95	12.96	3.33
4(C)	54.8	54.08	62.96	39.47	57.41	66.67
5(C)	13.15	14.8	12.96	26.32	22.22	30

Figure 6.1e: Part 1 Question 5 - Distributions of Students over the Different Questionnaire Scale Options



The results obtained for Question 5 also indicated the predominance of option 4 of the Perry 'C' category amongst all the levels. This could be interpreted as meaning that the students were aware of the benefits of challenges and only in agreement with their presentation to a certain extent, but not too strongly. This makes perfect sense when one considers that students are most interested in passing, which is usually made easier when fewer challenges are presented.

There were also marked increases in proportions for the Perry 'B' category, with figures for Level 1, early Level 2 and Level 3 exceeding 25% at 26.88%, 25.52% and 28.95% respectively. This could have indicated that at these levels, a considerable proportion of the students were possibly not sure whether it was beneficial for them for lecturers to present challenging, difficult issues. Perry (1999) states that students at this level in the scheme are usually concerned with evaluation issues. This could also have had a bearing in this case because the students might have considered the implications of challenges, in the form of difficult issues, on assessment. It could well be, while they appreciate the potential benefits of the challenges, they wondered how these would affect their preparation for exams, or even their performance in the same.

The results also showed that the late Level 2 group recorded the second highest Perry 'C' proportion. This would seem to support the observation made in question 4, where it also appeared like the group appreciated challenges. This makes one wonder how these students would seem to see the need for challenges while at the same time they seem not to be the most enthusiastic about independence from the lecturer. A re-visit of question 1 proportions would show that this level had the lowest proportion of Perry 'C's, and the highest proportions of both 'B's and 'A's compared to others.

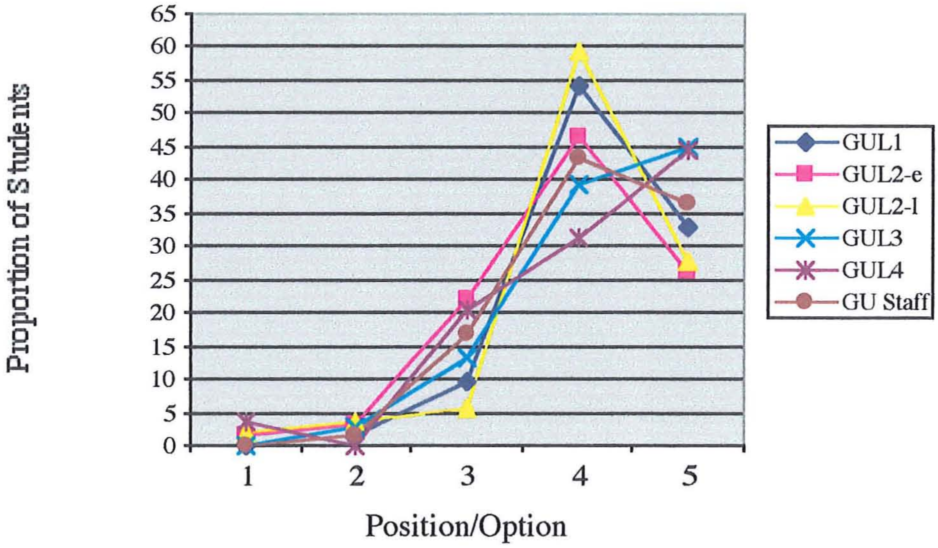
Question 6

'A' – I prefer not to work with other students because then I stand less chance of picking up wrong ideas. / **'C'** – It is good to work with other students because by listening to their points of view, I can evaluate my own.

Table 6.1f: Question 6 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	0	1.53	1.85	0	3.7	0
2(A)	1.77	3.06	3.7	2.63	0	1.67
3(B)	9.6	21.94	5.56	13.16	20.37	16.67
4(C)	54.06	46.43	59.26	39.47	31.48	43.33
5(C)	33.09	26.02	27.78	44.74	44.44	36.67

Figure 6.1f: Part 1 Question 6 - Distributions of Students over the Different Questionnaire Scale Options



Similar types of distributions as with the previous questions were observed here. There was a higher prevalence of Perry 'C' responses than the other categories. Position/option 4 of the Perry 'C' category was more popular than the extreme option 5, except for Levels 3 and 4. The fact that Levels 3 and 4 registered higher proportions of option 5 than 4 showed that the students in these groups had more confidence in their fellow students than the lower groups. This might have come about as a result of these groups' longer experiences working with fellow students.

There were also higher proportions of 'B's than 'A's in all the groups, though the 25% cut-off point was not reached in any of the cases. This might have indicated that at all of the four levels, the students appreciated working with their peers more than working on their own, though they might have not been that sure about being able to evaluate their views. It can then be further assumed that fellow students are to some extent, trusted as alternative sources of knowledge apart from the lecturers.

The results also show that faith in fellow students seemed to be strongest in the lower levels compared to that in the higher levels. The highest proportion of Perry 'C's was recorded for Level 1, while the lowest was recorded for Level 4. The distribution of Perry 'A's and 'B's however resulted in this rank-order being upset, though the proportions for these categories seemed to be very low. Level 4 recorded the third highest Perry 'A' and the 4th highest Perry 'B' proportions. This far, it was becoming clear that there was not necessarily a smooth 'growth or development' in the perceptions of the students as they progressed from the lower to the upper levels of their study. It was apparent that Perry's assertion that the progress was not a 'smooth' one was true. It was therefore becoming clear that the most sensitive way to try and detect this progress, if at all it occurred, would be to look at the general trends in results, which shall be done later.

Question 7

'A' - All one has to do in biology is to memorise things. / **'C'** - Instead of just memorising things, it is interesting to look for patterns and relationships among facts.

Table 6.1g: Question 7 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

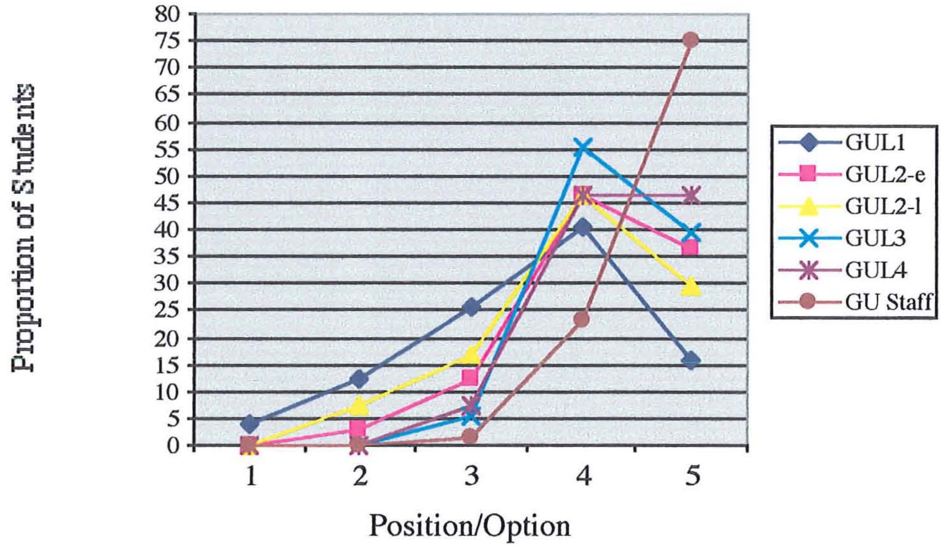
Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	4.14	0	0	0	0	0
2(A)	12.26	3.06	7.41	0	0	0
3(B)	25.7	12.24	16.67	5.26	7.41	1.67
4(C)	40.32	46.43	46.3	55.26	46.3	23.33
5(C)	15.95	36.73	29.63	39.47	46.3	75

Question 7 also gave a repeat in the general trend of the results so far. More Perry 'C's than 'A's and 'B's were recorded, with option 4 of the 'C' category being more popular than the fifth option, in all of the four levels. The upper levels (Level 3 and 4) appeared to be more advanced than the lower levels. However the rank-orders of proportions of the Perry categories were not necessarily in increasing order. Level 3 produced the highest proportions of 'C's, and lowest proportion 'B's and 'A's followed by Level 4.

Even though it produced the lowest proportion of 'B's, the late Level 2 group registered the highest proportion of 'A's, though very low at 5.55%, and the second-lowest proportion of 'C's. It was becoming clearer that this group seemed to generally have lower perceptions than the early level 2 group.

The Level 1 group produced the highest proportion of Perry 'B's, just above 25%, at 25.7%. It was also the only group to reach this cut-off point. It was understandable that this could be the case since at Level 1, the students might still be used to relying only on the instructor as a source of knowledge. A considerable proportion of them might therefore still feel

Figure 6.1g: Part 1 Question 7 - Distributions of Students over the Different Questionnaire Scale Options



uncomfortable accepting that their peers could also possess genuine knowledge.

Question 8

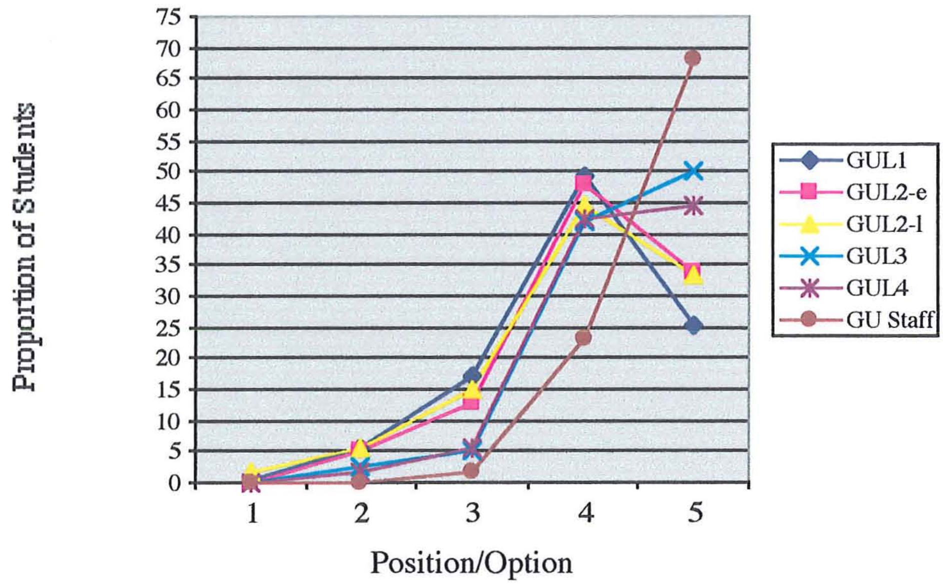
'A' – Science outlines a set of facts about what is happening in the world. A student needs to develop ways of memorising these facts. / **'C'** – I do not believe that all scientific facts represent the 'absolute truth'. Students should try and understand arguments for and against existing knowledge.

Table 6.1h: Question 8 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	0.44	0	1.85	0	0	0
2(A)	5.76	5.1	5.56	2.63	1.85	0
3(B)	17.13	12.76	14.81	5.26	5.56	1.67
4(C)	49.48	47.96	44.44	42.11	42.59	23.33
5(C)	25.26	33.67	33.33	50	44.44	68.33

Question 8 also produced the typical trends in results. There were more Perry 'C's than 'A's and 'B's. Higher proportions of option 4 than 5 were recorded for the lower levels, except Levels 3 and 4, indicating that these upper levels were more developed in their perceptions than the lower levels. Higher proportions of Perry 'B's than 'A's were recorded, even though these did not exceed the 25% cut-off point.

Figure 6.1h: Part 1 Question 8 - Distributions of Students over the Different Questionnaire Scale Options



The students in all the levels therefore seemed to be aware of multiplicity in knowledge, and that they needed to weigh out options, though they were generally still not quite sure to what extent the knowledge they were presented with could be 'true'.

Once again, the proportions of the different Perry categories in the various groups showed that progress is not necessarily linearly related to course level. There seemed to be some issues hindering smooth and gradual progress that could not be exposed in this section.

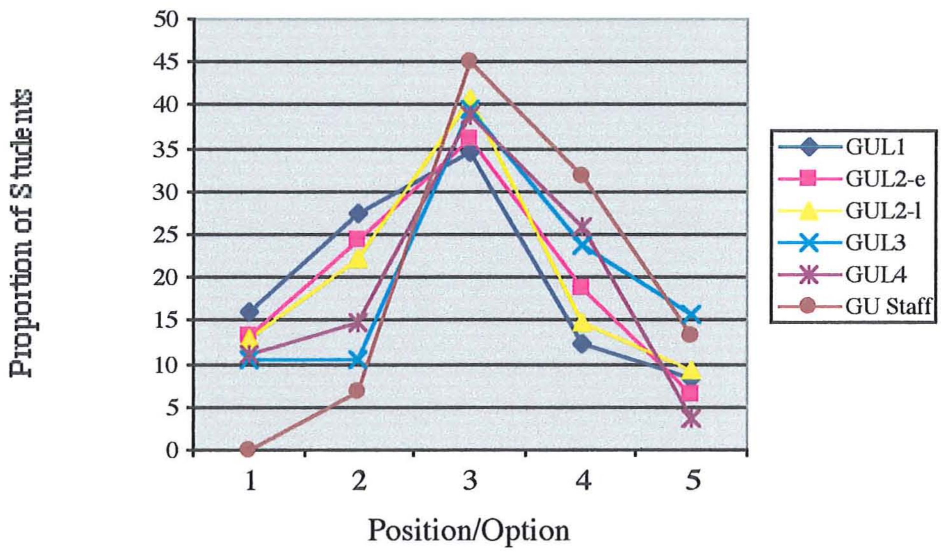
Question 9

'A' – I prefer to learn facts and be tested on them in short questions. / **'C'** - I find short questions restrictive as they do not give me the opportunity to explain what I know and understand.

Table 6.1i: Question 9 – Percentage Distributions of Students and Staff over options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	16.1	13.26	12.96	10.53	11.11	0
2(A)	27.33	24.49	22.22	10.53	14.81	6.67
3(B)	34.56	36.22	40.74	39.47	38.89	45
4(C)	12.26	18.88	14.81	23.68	25.93	31.67
5(C)	8.42	6.63	9.26	15.79	3.7	13.33

Figure 6.1i: Part 1 Question 9 - Distributions of Students over the Different Questionnaire Scale Options



Question 9 produced a complete turn in the trend of results that had been observed in the previous questions. Whereas all the other questions seemed to produce distributions somewhat skewed towards the Perry 'C' category, Question 9 gave rise to distributions that looked like normal distributions in that the modal position was the Perry 'B' position in the middle. This carried the implication that at all levels, the students were confused as to what kind of question format was best for them. It could be argued that though they might have known that short questions were not good for assessing their deeper knowledge, they were not comfortable with being asked to explain themselves. If that were the case, this would have indicated that all the students would like to see happen is for them to be given an opportunity for easy passing.

The fact that the Staff sample, however, also had a modal Perry 'B' position indicated that there might have been more to the problem than students just wanting an easy way out. It is possible that the students' responses might have actually been responses to the system. What this finding seemed to reveal was that there were some problems in relation to exam format that was experienced by both the staff and the students. It would appear confusion reigned as to the effectiveness or lack of effectiveness of short questions in assessing the students. This issue shall be addressed in more detail later.

The results seemed to indicate that in general, when it came to issues relating to exam format, the students reverted to functioning at a Perry 'A' level. It could be speculated that since the students generally operated at more advanced levels in other issues, there might be something about the exams they sat that made them see short answer questions more appealing than questions that demanded that they showed more of their own knowledge and understanding.

It was interesting to note that Level 3 here produced the highest and lowest proportions of Perry 'C's and 'A's respectively. This made the group appear more 'developed' than Level 4, once again, in this regard. This group however produced the second highest proportion of Perry 'B's, after late Level 2, which meant that it had the second highest level of confusion on this issue.

Similar trends in the rankings of Perry 'C' proportions were also observed here. Level 3 came up highest, Level 4 second highest, followed by early level 2, late Level 2 and then Level 1. This once again, proved that progress was not necessarily from lowest to highest level in that order. There appeared to be some blocks in this progress, and this was more evident at late Level 2.

Question 10

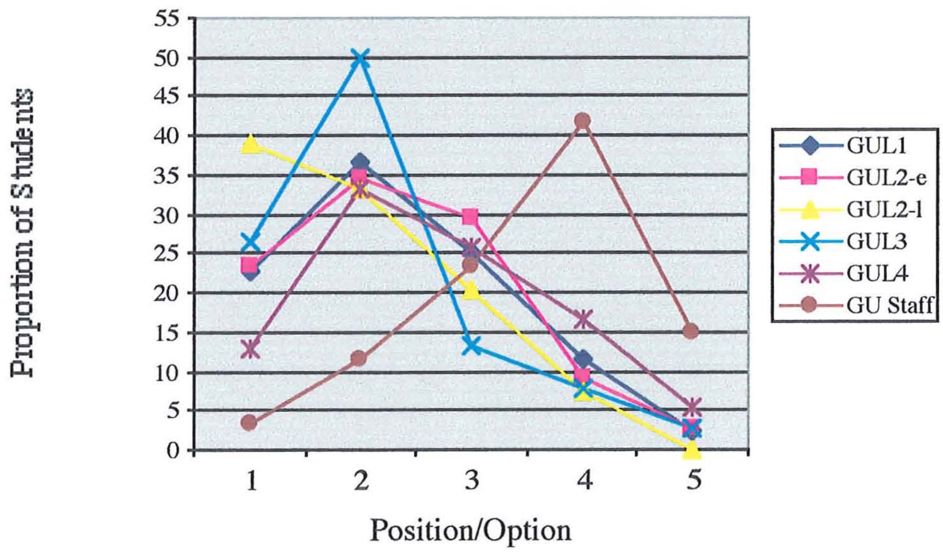
Questions 10 also dealt with assessment issues, but it referred to exam content instead of format. The results produced by this question were also very different from the trends observed in the non-exam-related questions. In this case, the distributions were reversed in that they were all skewed towards the Perry 'A' Position. This observation was interesting in that this question was somewhat related in meaning, to Question 1, and yet the distributions were totally opposite. Question 1 sought to find out if the students felt that they needed only to study what the lecturers taught in order to pass their courses, or if they felt they need not rely entirely on lecturers, but have an input of their own. Question 10 on the other hand went a step further and asked students if they preferred question based only on what the lecturer taught or rather those demanding their own thinking. Both question are repeated below to get a feel of the phraseology:

Question 1**: 'A'** *In order to pass my course, I need to study just what the lecturer indicates or tells me. /*
'C' *- I do not have to rely totally on the lecturer. Part of my learning is to work things out myself.*
Question 10: 'A' – In exams I prefer questions which are based on what the lecturer taught / **'C'** In exams I prefer questions that demand thinking beyond what is taught in class.

Table 6.1j: Question 10 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	22.9	23.47	38.89	26.32	12.96	3.33
2(A)	36.63	34.69	33.33	50	33.33	11.67
3(B)	25.11	29.59	20.37	13.16	25.93	23.33
4(C)	11.52	9.18	7.41	7.89	16.67	41.67
5(C)	2.36	2.55	0	2.63	5.56	15

Figure 6.1j: Part 1 Question 10 - Distributions of Students over the Different Questionnaire Scale Options



What these results then indicate is that the students seemed to exhibit a typical 'double-standard' in their learning. While they did not believe that all they needed to pass their exams was to study just what the lecturer taught, they on the other hand seemed all too happy to accept questions based solely on what the lecturer taught. On a similar note, it can be assumed that while they believed that part of their learning was to work things out themselves, they were not happy to be asked questions demanding their own thinking. This 'double-standard' could be seen to spell out only one thing, the students wanted the easy way out, to pass without any struggle, even though they knew what could be beneficial to them in the long run.

Another possibility could have been while they knew the benefits of being asked to demonstrate independent thought and work, they were not given much opportunity to do so, and so were not quite happy to be faced with such tasks in exams. This thinking goes in line with the findings of Question 9, which indicate that the students and the lecturers were, to some extent, uncomfortable with questions that did not take the short question format.

The results also indicated much higher proportions for the Perry 'B' category in Question 10 than in Question 1. This ties in well with what has already been discussed. If indeed the students do know and appreciate the fact that they should have an input in their own work, there should be a considerable number of them who would feel uncomfortable in expecting the exams to be based entirely on lectures (though they knew they could pass easily from that). On the other hand, one could also argue that these students might have been put in this predicament by the fact that what they expected in exams was not necessarily what they ended up getting. In other words, they might not have been given the challenges they expected, and ended up not knowing whether they were in the wrong to expect them or not.

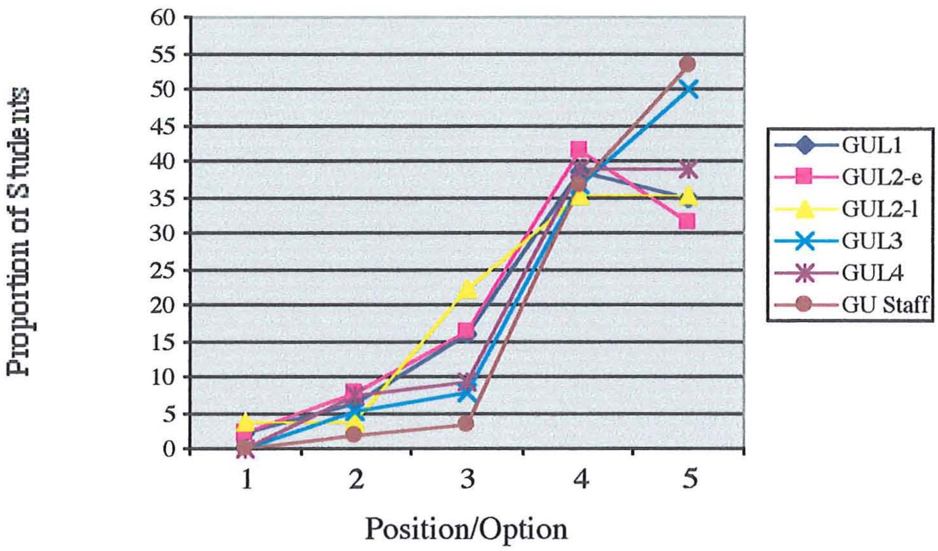
Question 11

'A' – In exams, I expect to be rewarded for giving as much information as possible. / **'C'** – I believe what should matter in exams is the quality of my answers, not how much I write.

Table 6.1k: Question 11 – Percentage Distributions of Students and Staff over the options on the Questionnaire Scale

Position	GUL1	GUL2-e	GUL2-l	GUL3	GUL4	Staff
1(A)	2.36	2.04	3.7	0	0	0
2(A)	6.35	7.65	3.7	5.26	7.41	1.67
3(B)	16.1	16.33	22.22	7.89	9.26	3.33
4(C)	38.55	41.84	35.19	36.84	38.89	36.67
5(C)	34.86	31.63	35.19	50	38.89	53.33

Figure 6.1k: Part 1 Question 11 - Distributions of Students over the Different Questionnaire Scale Options



The results for Question 11 surprisingly, almost exhibited the typical distribution observed with other questions that were not related to assessment. This questions however, did have reference to exams, as the students were asked whether they expected to be rewarded for quality or quantity in exams. It could be taken to take a similar tone as Question 1, as it deals with the students themselves 'receiving' marks or being rewarded for their answers. This could possibly be a reason why these two were different from Question 10, especially. One can almost 'feel' that the students are comfortable dealing with issues relating to 'receiving marks' as opposed to those asking them questions, or put differently, asking them to 'give answers'. However, this is but, only a speculation.

While there were still higher proportions of Perry 'C' responses compared to Perry 'A' and 'B' ones at all levels, option 4 in the Perry 'C' category did not seem to be too dominant over option 5. This was only the case in Level 1 and early Level 2. For late Level 2 and Level 4, the two options were equally distributed. At Level 3 however, option 5 was evidently too dominant at 50% against 36.84% for option 4.

This difference could have come about as a result of the fact that the question deals with the quality/quantity of the material to be presented. Not many students would be happy to admit that they would very much like to produce huge quantities of mediocre work. These students would clearly without hesitation opt for the extreme option of the Perry 'C' statement. At the same time some students tend to believe that providing as many arguments to a question as possible would probably give them a better chance of passing, but still they understand that these arguments would have to be related to the issue in question. It is this last group who would probably not want to indicate a strong agreement with the Perry 'C' statement.

As with most of the other questions, the rank-orders for Perry 'C' proportions ended with late Level 2 being the lowest and Level 3 being the highest. Level 3 also had the lowest proportions of Perry 'B' and 'A' categories. These results seemed to corroborate the findings from most of the other questions. This proved that the questionnaire was very sensitive as picking out the differences between these levels, and therefore could be taken to be quite valid in measuring what it sought to measure.

The above results are brought together below in summation to try and pick out trends that emerged from this section.

6.2.2 General trends observed in Part 1 results

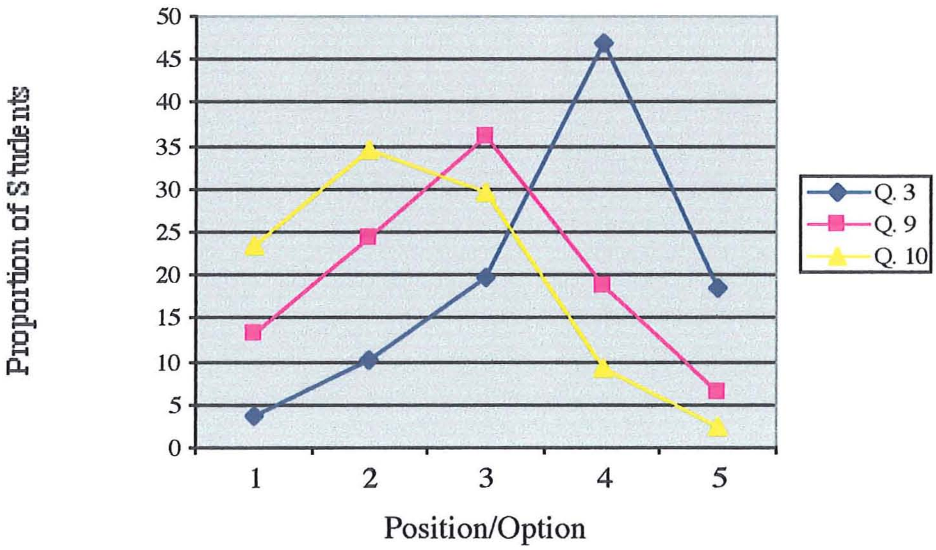
6.2.2.1 Dominance of Perry 'C' thinking at all levels in all aspects of students' learning apart from assessment issues

There were three main types of distributions that seemed to emerge from the results. The distributions for all the questions, except for Questions 9 and 10, seemed to be skewed towards the Parry 'C' category. Those for Questions 9 and 10 however, took totally different shapes. Question 9 distributions all seemed to have a modal position 3 in the scale (Perry 'B' category), whereas those for Question 10 were skewed towards the Perry 'A' category. The differences between these three main types of distributions observed from the 11 questions are illustrated in Figure 6.2 below. The results used for plotting these graphs were the early Level 2 results from Questions 3, 9 and 10 (Table 6.2), which were taken to represent the typical outlook.

Table 6.2: Early Level 2 Results from Part 1

Position	Q. 3	Q. 9	Q. 10
1 ('A')	3.57	13.26	23.47
2 ('A')	10.2	24.49	34.69
3 ('B')	19.89	36.22	29.59
4 ('C')	46.94	18.88	9.18
5 ('C')	18.37	6.63	2.55

Figure 6.2: Types of Distributions Observed in Part 1



The shape of the distributions in most of the questions (see Q. 3 graph in Figure 6.2) gave rise to the conclusion that, in general, students at all levels took a Perry 'C' type of outlook to most of the aspects of their learning. These aspects were those relating to their roles as students, roles of lecturers, roles of fellow students, and view of knowledge. The students seemed to be aware of the importance and benefits of their participation in their own learning. They were against full dependence on lecturers without exercising their own thoughts. They also seemed to be aware that the lecturers did not possess irrefutable knowledge, and that they as students had the right to question this. It was therefore no wonder that they saw their fellow students as legitimate sources of knowledge to be consulted as well, for a variety of opinions and self-evaluation. All these perceptions tied in well with their understanding of the fact that knowledge is not made of separate 'absolute truths'. They were also aware that in some cases there could be more than one way of looking at an issue and that they had to involve themselves in weighing up these options.

Questions 9 and 10 had distributions that were totally different from the trend observed with other questions. The two questions stood out in that both dealt with assessment issues. Question 9 dealt with the issue of examination format while Question 10 addressed itself to exam content. Though they had the examination issue in common, their distributions were not at all similar. This must have obviously come about as a result of the fact that they dealt with two different aspects of examinations, format and content.

Question 9 distributions, as already stated, had a modal position 3 in the scale, which was equivalent to Perry Position 'B'. This meant that most students might have been confused as to whether short questions were either good or bad for assessing them. The implications of this were discussed in Section 6.2.1. This could have either meant that even though they might have known the benefits of not being asked short questions, they were not confident enough to express themselves in longer questions. This could be interpreted as meaning that there was something about exam structure or format that promoted this thinking. As argued in Section 6.2.1, the outlook might have been born out of practice. The fact that the shape of staff's distribution was similar to those of the students was taken to be a possible indicator of this.

Question 10, which dealt with exam content produced results totally opposite from those in other questions. A prevalence of Perry 'A' type of thinking was detected here. It was concluded that even though the students might have indicated that they believed they had the responsibility to do independent work and thinking, they were not happy to be asked questions demanding evidence of these operations. It was also noted that another possibility could be they were not provided with this opportunity by the type of exams they were already being made to sit, which could explain the distribution in Question 9, for staff too.

6.2.2.2 Dominance of Option 4 instead of 5 of the Perry 'C' category on the scale

It was also observed that option 4 of the Perry 'C' category was more popular than option 5 in most of the questions. This could be taken to indicate that even though the students agreed with the Perry 'C' statements, the agreements were not necessarily very strong. This instrument could not adequately detect the exact extent of this agreement, however. It is possible that the students could have even been between options 3 and 4, but more towards 4.

6.2.3 'Developmental trends' observed in Part 1 results

An attempt was made to try and find out which group seemed to be more advanced than the others and in what direction the 'growth' might have occurred. The proportions of Perry 'A', 'B' and 'C' thinkers produced by each group for each question were then compared. These proportions were then ranked according to increasing order.

The results are shown in Table 6.3. The Level with the lowest Perry 'A' or 'B' is given position 1 in the rank, while one with the highest proportion is given position 5 in the rank. For Perry 'C', the Level with the highest proportion is given position 1 in the rank, while one with the lowest proportion is given position 5. The ranks are based on values in Tables 6.1a to 6.1k.

The rank orders were observed to differ slightly in all of the 11 questions. The general trend in the positions of the groups in the ranks was however easily observable. Each of the Perry categories was treated separately at first, and thereafter the general outlook in the direction of growth determined, based on results for each category.

Table 6.3: Rank-orders of the Different GU Groups over the Three Perry Categories for each Question (Part 1)

Level of Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Perry 'A'											
Level 1	2	4	2	4	1	1	4	4	5	3	3
Early Level 2	3	1	3	3	2	4	2	3	4	2	4
Late Level 2	5	3	4	2	4	5	3	5	3	4	2
Level 3	4	2	5	1	3	2	*1*	2	1	5	1
Level 4	1	5	1	5	5	3	*1*	1	2	1	2
Perry 'B'											
Level 1	4	5	3	4	4	2	5	5	1	3	3
Early Level 2	3	2	4	5	3	5	3	3	2	5	4
Late Level 2	5	4	5	2	2	1	4	4	5	2	5
Level 3	1	1	1	3	5	3	1	1	4	1	1
Level 4	2	3	2	1	1	4	2	2	3	4	2
Perry 'C'											
Level 1	3	5	4	5	4	1	5	5	5	2	4
Early Level 2	4	1	3	4	3	4	3	3	3	3	3
Late level 2	5	3	5	2	2	2	4	4	4	5	5
Level 3	2	2	2	1	5	3	1	1	1	4	1
Level 4	1	4	1	3	1	5	2	2	2	1	2

The numbers in *Italics* in Table 6.3 above indicate instances where the rank was shared between levels.

The level(s) with the highest number of questions for each position in the rank-order was determined from the table above and highlighted in **bold** and *Italics*. It has to be remembered that position 1 means the group had the highest proportion of Perry 'C's and lowest proportion of Perry 'A' or 'B', and was therefore regarded as the most advanced. From these results the rankings, only a rough estimate or bird's eye view of which levels appeared most or least advanced can be determined, with a limited amount of accuracy. The rank-orders can only be more accurately determined using a statistical analysis, which follows in Section 6.2.4.

Perry 'A' Rankings:

A quick browse at Table 6.3 reveals that Levels 3 and 4 were more advanced than other levels, as they had the highest number of questions in which they appeared first in the ranks.

Late Level 2 appears to be the least advanced as it registered at position 5 in the ranks in more questions than other levels.

Perry 'B' Rankings:

The same observation as in Perry 'A' rankings was made here, with Level 3 appearing to produce lower Perry 'B' proportions than Level 4 (more questions at which Level 3 occupied position 1 than Level 4). Late Level 2 again seemed to be least advanced, with more questions than any other level in which it registered position 5.

Perry 'C' Rankings:

The observations made for this category were found not to be different from those made for Perry 'A' and 'B'. From these results the following general conclusions could be drawn.

6.2.3.1 No smooth intellectual growth in students as they progress from year to year

The results suggest that there was obviously no smooth advancement in perceptions of students as they progressed to upper levels of their studies. The ranks in the three Perry categories were similar showing Late level 2 was the least advanced, instead of Level 1. These results indicate that there were some obstacles met by the students as they progressed from year to year.

6.2.3.2 Differences between Level 3 and Level 4

Level 3 had the lowest proportion of Perry 'A's and 'B's, and highest proportion Perry 'C's in most of the questions than any other level, followed by Level 4. This made it appear to be the most advanced in as far as students' perceptions are concerned. Though the frequencies for the different Perry categories seemed to suggest that Level 3 was more advanced than Level 4, in most of its distributions option 4 on the questionnaire scale seemed to be much more popular than option 5. For Level 4 however, in most of the distributions this difference was not as distinct as it was in Level 3 distributions, as can be seen from Figures 6.3a-k. This seemed to indicate that though registering higher proportions of Perry 'C's, the Level 3 students were mostly at the very beginning of this category, while generally higher proportions of the Level 4 students showed much stronger Perry 'C' perceptions.

Figure 6.3: Comparisons of the Part 1 distributions for Levels 3 and 4

Figure 6.3a: GUL3 vs. GUL4 (Part 1-Q1)

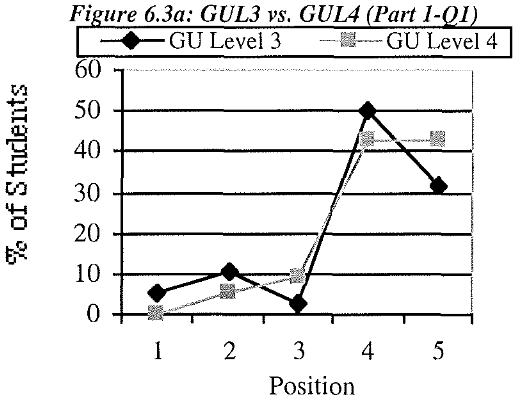


Figure 6.3b: GUL3 vs. GUL4 (Part 1-Q2)

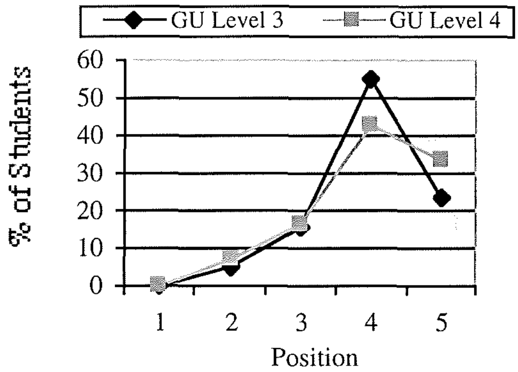


Figure 6.3c: GUL3 vs. GUL4 (Part 1-Q3)

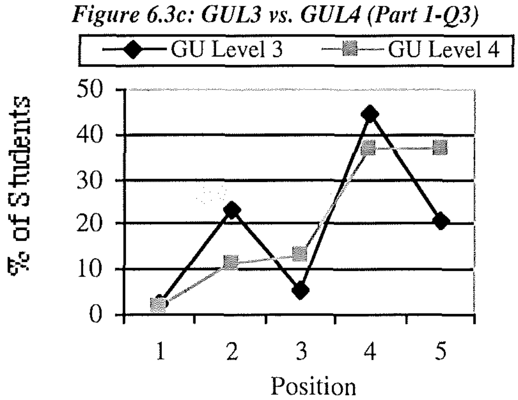


Figure 6.3d: GUL3 vs. GUL4 (Part 1-Q4)

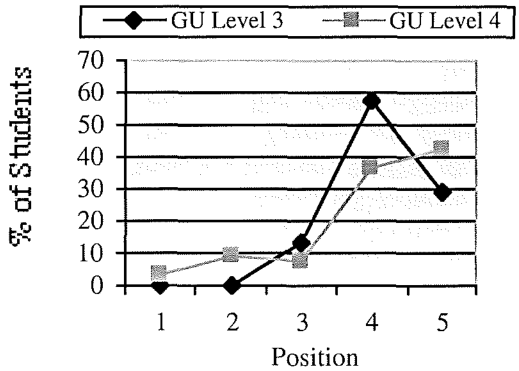


Figure 6.3e: GUL3 vs. GUL4 (Part1-Q5)

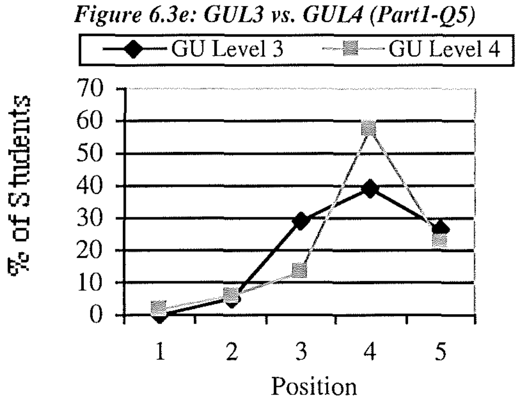


Figure 6.3f: GUL3 vs. GUL4 (Part 1-Q6)

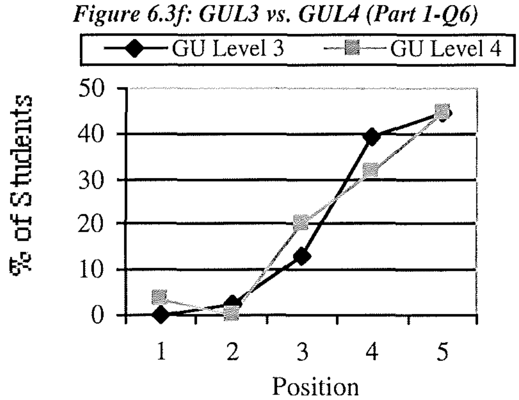


Figure 6.3g: GUL3 vs. GUL4 (Part 1-Q7)

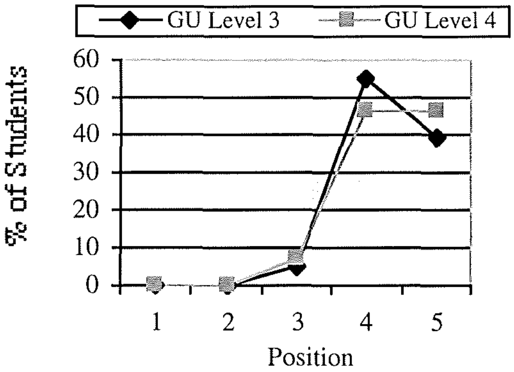


Figure 6.3h: GUL3 vs. GUL4 (Part 1-Q8)

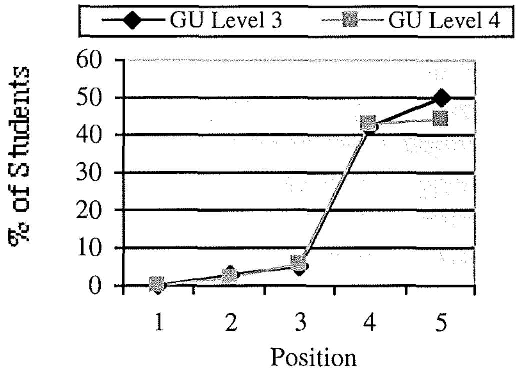


Figure 6.3i: GUL3 vs. GUL4 (Part 1-Q9)

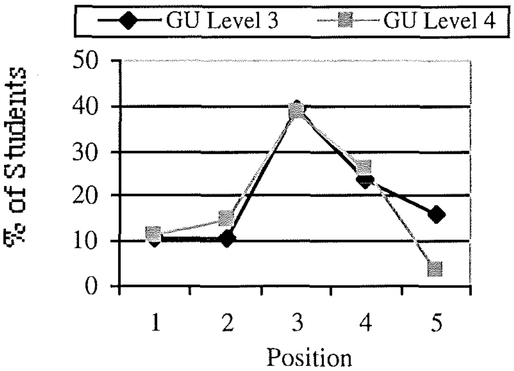


Figure 6.3j: GUL3 vs. GUL4 (Part 1-Q10)

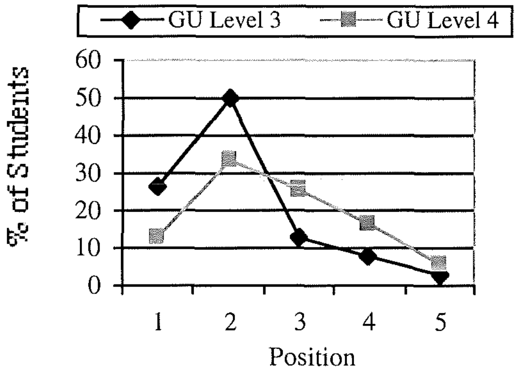
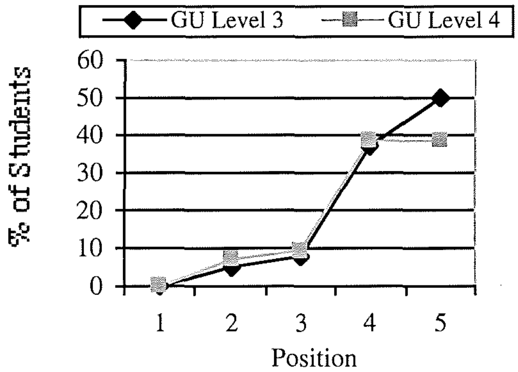


Figure 6.3k: GUL3 vs. GUL4 (Part 1-Q11)



6.2.3.3 The case of problems experienced at late Level 2

Another observation that came out even more clearly from the Rank-orders was that early Level 2 occupied a higher position in the ranks than late Level 2. In this respect, it can be said that late Level 2 proved to be definitely less advanced than early Level 2. It could therefore be safely concluded that there might have been something happening at late Level 2 that might have caused this. Since the questionnaire was administered in April, it could be speculated that this could have had something to do with preparation for the end-of-year exams. It could then be argued that the students might have felt more anxious around that time. This would therefore explain why they would express preference for being provided with more by lecturers than working independently.

On the other hand, one could argue that preparation for the modular exams taken at the end of the first term, around December and January, should have produced the same effect at early Level 2. In this case, the administration of the questionnaire was done in November. One could then be led to assume that whatever might have caused this 'back-drop' in the perceptions of students at late Level 2 could have therefore been a result of what was experienced before the administration of the questionnaire. This would then rule out anxiety due to preparation for the coming end-of-year exams.

The issue of exams could however not be totally ruled out, but this time, not as in the coming exams, but exams already set in December or January. One could think that having set exams at the end of the first term, the students might have been possibly demoralised by the experience. While this could or would possibly offer an explanation as to the difference between early and late Level 2, it does not quite explain why Level 1 perceptions were generally better than those of late Level 2. The questionnaire was administered to the Level 1 group in March, after the end-of-term exams too.

It would therefore appear that there is more to this issue than just the timing of exams. It appears this Level 2 problem is not confined to the biology students of the University of Glasgow only. Grinnell (1987), who dealt with students' attitudes to science, in the United States of America, documented a similar kind of observation. He appeared to attribute this problem to the challenge associated with struggling with independent work when he wrote:

> ...Once engaged in independent work, many students find themselves committed to an intellectual challenge with no sure-to-work methods or guarantees of success. As a consequence, many students go through a depressing period, often in their 2nd year of graduate school – that has been called the 'sophomore slump'. The fact that students may be probationary during this time increases the sense of uncertainty. Eventually students either accept the uncertainty of science or drop out of graduate school...(Grinnell (1987); pg. 56.)

This quotation is loaded with what can be clearly identified as Perry 'B' type of thinking. The depression Grinnell states students feel when faced with uncertainty in science is tantamount to the frustration that Perry states students feel when faced with uncertainty in multiplicity. It would make sense that this should be felt at 2nd but not 1st year, since 1st year students might still be excited at the prospect of finding and asserting themselves in a new world where they should show their competence and responsibility as independent workers. After all, the 1st year students could be said not have had the experience of (tertiary) science as yet. Grinnell also states that, viewed from outside science, the search for new knowledge has a mystique that makes that search appear very attractive. However, after some experience with a few tasks and exams, the students might start feel uncomfortable within such huge responsibilities.

The 'acceptance of uncertainty in science' that Grinnell talks about in the final sentence of the quotation could be equated to Perry's transition from a Perry 'B' kind of perspective, to a much higher level that would be symbolic of progress. This the ties in well with the results, as it was observed that after this 'slump' at late Level 2, the students' perspectives seemed to pick up at Level 3. This, could be due to the realisation of the true nature of science, that it is not entirely certain and made of absolutes. Students could possibly be now aware, at that stage that their engagement in search for their own knowledge and ways of looking at things could be a worthwhile experience.

Grinnell (1987) also alludes to the alternative option of students dropping out of school in despair. One can only hope that this did not happen to most students in this case. However, what was observed at late Level 2 could be associated with one of the 'alternatives to growth' outlined by Perry. This process, which Perry calls 'Retreat', is defined as a regression to a lower level of the scheme as a result of finding difficulties in the level they are currently operating at. If one finds difficulty in Relativism for instance, Perry states that they would regress back to Multiplicity, where they would insist on 'everyone having a right to their own opinion'. Retreat from Multiplicity would therefore take one back to Dualism, where they would prefer the earlier, easier way out of things, more common at school.

Perry states that students might be forced into Retreat by anxiety, where they might feel they are left to cope too much on their own. The students might then end up feeling that lecturers hold on to information and they, the students, do not receive enough help. They would therefore express preference for being taught more by lecturers, as they would have lost confidence in themselves.

The results have indeed shown that there is no smooth progress from Level 1 to 4 as might have been hoped. However, there was some indication of the fact that some element of progress took place as the upper levels, Levels 3 and 4, did hold higher perceptions according to the Perry scheme, than the lower levels.

The reliability of the questionnaire can be said to have been shown by the reproducibility of results when it was administered to the same students at Levels 1 and 2. The fact that the distributions or graphs almost had similar shapes for all the different levels in the different questions could be taken to be an indication of its validity in measuring what it purports to measure.

6.2.4 Chi-square treatment of Glasgow University Part 1 results

So far, the results have shown how the students' perceptions differ in the five levels without actually showing how significant the differences were. A chi-square treatment of the results gave a measure of how these levels differed, and to what extent. The chi-square test showed how the different student distributions over the five options of the questionnaire scale compared. These comparisons were made between the distributions of each group and those of each one of the other four groups, for all of the eleven questions. The computations were made using the raw frequencies instead of the percentage distributions. Table 6.4 below shows the results of these comparisons.

Table 6.4: Chi-square values for the comparison of the different Glasgow University Levels (Part 1)

Levels	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
L1 vs L2e	3.44 *df=3*	**24.3** ***df=3***	2.67 *df=3*	1.68 *df=3*	0.86 *df=3*	**27.7** ***df=2***	**65.5** ***df=3***	6.07 *df=3*	6.76 *df=4*	1.85 *df=3*	1.02 *df=3*
L1 vs. L2l	7.45 *df=3*	3.96 *df=2*	**9.72** ***df=3***	**15.1** ***df=2***	1.34 *df=2*	0.68 *df=2*	**9.79** ***df=2***	1.50 *df=2*	1.59 *df=3*	**7.01** ***df=2***	0.59 *df=2*
L1 vs. L3	0.15 *df=2*	4.75 *df=2*	0.51 *df=2*	3.95 *df=2*	**6.13** ***df=2***	1.99 *df=1*	**38.0** ***df=1***	**10.7** ***df=1***	**7.19** ***df=1***	4.05 *df=2*	4.28 *df=2*
L1 vs. L4	3.97 *df=2*	**12.2** ***df=4***	6.80 *df=3*	**8.62** ***df=2***	4.82 *df=2*	**13.1** ***df=2***	**30.0** ***df=1***	**10.8** ***df=1***	6.03 *df=3*	4.88 *df=3*	1.58 *df=2*
L2e vs. L2l	3.35 *df=3*	1.32 *df=2*	3.46 *df=3*	**7.98** ***df=2***	1.31 *df=2*	5.83 *df=2*	2.47 *df=2*	0.54 *df=2*	0.36 *df=3*	5.79 *df=2*	0.60 *df=2*
L2e vs. L3	1.52 *df=2*	0.08 *df=2*	0.15 *df=2*	3.82 *df=2*	3.97 *df=2*	5.62 *df=2*	0.06 *df=1*	3.58 *df=1*	4.84 *df=2*	4.67 *df=2*	5.17 *df=2*
L2e vs. L4	3.46 *df=2*	2.29 *df=2*	**8.59** ***df=3***	3.83 *df=2*	3.06 *df=2*	**7.03** ***df=2***	1.43 *df=1*	3.04 *df=1*	2.23 *df=3*	5.81 *df=3*	2.26 *df=2*
L2l vs. L3	2.73 *df=2*	0.40 *df=2*	1.47 *df=2*	4.21 *df=2*	5.27 *df=2*	3.91 *df=2*	0.97 *df=1*	2.58 *df=1*	3.27 *df=2*	2.73 *df=2*	3.85 *df=2*
L2l vs .L4	**8.28** ***df=2***	3.47 *df=2*	**9.40** ***df=3***	0.66 *df=2*	1.62 *df=2*	**9.24** ***df=2***	3.19 *df=1*	1.85 *df=1*	1.13 *df=3*	**12.2** ***df=2***	2.08 *df=2*
L3 vs .L4	1.16 *df=2*	1.55 *df=2*	2.72 *df=2*	3.82 *df=2*	3.23 *df=2*	1.15 *df=2*	0.42 *df=1*	0.08 *df=1*	0.79 *df=2*	**7.07** ***df=2***	0.76 *df=2*

Critical Values

	0.05	**0.01**
• Degrees of freedom **(df)** =1	3.84	6.64
• Degrees of freedom **(df)** = 2	5.99	9.21
• Degrees of freedom **(df)** = 3	7.82	11.34
• Degrees of freedom **(df)** = 4	9.49	13.28

(Values from Lewis (1967))

The values in **bold** indicate instances where the differences were significant. The level of significance can be interpreted from the values given below the table, adopted from Lewis (1967). Some very interesting trends were observed from the results.

6.2.4.1 Comparison of Level 1 with the upper levels (Levels 3 and 4)

It was evident that there was an element of significance in the difference between Level 1 and Level 4, even though this was in only 5 out of 11 questions (Qs 2, 4, 6, 7, and 8). The significance levels for these differences were 0.05 for Qs 2 and 4, and 0.01 for Qs 6, 7 and 8. In one of these questions (Q6), Level 1 produced a higher proportion of Perry 'C's (87.15%) than Level 4 (75.92%), a lower proportion of Perry 'B's (9.6 % vs. 20.37%) and a lower proportion of Perry 'A's (1.77% vs. 3.77%). This means that we can be 99% sure that Level 1 was better than Level 4 in their belief of the benefit of working with fellow students.

The number of questions in which Level 4 students were significantly better than Level 1 in their perceptions was therefore brought down to 4. This means we could be 99% sure that the Level 4 group was more advanced than Level 1 group in all the aspects relating to these questions. The Null Hypotheses that there would be no significant difference between Level 1 and Level 4 groups can therefore be rejected for these questions. These were issues relating to the students' authority to question their lecturers' words (Q2); the lecturer's role in as far as presentation of different views is concerned (Q4); the students' role in as far as their approach to learning is concerned – whether to memorise or look for patterns (Q7); and the nature of science, in as far as representation of the 'truth' is concerned (Q8).

There were also 4 questions (Qs 5, 7, 8 & 9) in which there was a significant difference between Level 1 and Level 3 groups. In three of these questions (Qs 7, 8 & 9), Level 3 had higher Perry 'C' proportions and lower Perry 'B' sand 'A' s than Level 1 (except in Q9, where Level 3 had a slightly higher proportion of Perry 'B's). The significance level for these differences was 0.01 for all the three questions. We can therefore be 99% sure that the differences between the distributions of these two groups did not arise by chance. We can therefore be 99% certain that more Level 3 students preferred looking for relationships among facts instead of memorising them, did not believe that scientific facts represent the 'absolute truth', and found short questions more restrictive than Level 1 students did.

There was one question (Q5), however, in which Level 1 students had a significantly more advanced perspective than level 3 students. Level 1 students were more prepared to face challenges than Level 3 students, but we could only be 95% sure of this. This brought the questions in which Level 3 students were significantly more advanced than Level 1 students to three, a number lower than that in which Level 4 students were significantly more advanced than this group.

Even though the differences between Level 1 and these two groups were in different questions in some cases, the fact that they were, observed in nearly the same number of questions had some significance. These groups seemed to be not too different from each other, especially that the results of their comparison yielded only one question (Q10) where level 4 was more advanced than Level 3. This was actually the only question in which there was any significance detected in their differences.

6.2.4.2 Comparison of Levels 3 and 4 with early and late Level 2

Even though they might have appeared to be not particularly different in this respect, comparison of Levels 3 and 4 with early and late Level 2 did prove that level 4 was a little more advanced. It was observed that no significant difference was observed between Level 3 and either of early or late Level 2. Level 4 however, differed significantly from early Level 2 in two question (Qs 3 and 6); and from late Level 2 in four questions (Qs 1, 3, 6 and 10). In all of these instances, level 4 proved to be more advanced, in respect of the proportions of Perry 'A', 'B' and 'C' thinkers found in these groups. This observation also served to support the assumption that early Level 2 was that little bit more advanced than late Level 2.

The finding that Level 4 was significantly more advanced than Level 3 disagrees with the estimate rank-order suggested in Section 6.2.3, in which Level 3 appeared to be more advanced than Level 4. However, it can be concluded that in most of the questions where Level 3 seemed to be more advanced, this was not statistically significant. This then agrees with the observation made in Section 6.2.3.2, where it was found that in most questions higher proportions of Level 3 students seemed to have 'weaker' agreements with Perry 'C' statements. In contrast to this, there was not much difference between the proportions of Level 4 students who agreed strongly with these statements and those who agreed with them less so. This, as stated in Section 6.2.3.2, might be an indication of more confidence in the part of Level 4 students, suggesting a higher level of intellectual maturity.

6.2.4.3 Comparison of Level 1 with early and late Level 2

Comparisons between Level 1 and early and late Level 2 also served to support the assumption above. When Level 1 was compared with early Level 2, significant differences appeared in three questions (Qs 2, 6 and 7). In two of these questions (Qs 2 and 7) early Level 2 was more advanced than Level 1, as it produced a higher Perry 'C' proportion, and lower Perry 'A' and 'B' proportions. In the comparison between late Level 2 and Level 1, there were four questions where significant differences were observed (Qs 3, 4, 7 and 10). In two of these questions (Qs 4 and 7), late Level 2 was more advanced than Level 1. What this means is that there was only one instance where Level 1 was more advanced than early Level 2, whereas there were two such instances in the case of late Level 2.

Though this might seem insignificant, considering that in total there were 11 questions, this observation is worth a mention. It should however, not be ignored that the comparison of the two levels yielded only one question where they were significantly different. This was in Q4 in which early Level 2 was more advanced, judging from the Proportions of Perry 'C' and 'A' proportions in the two groups. So what can be said now is that, although the rankings in 6.1.3 might have shown that early Level 2 was more advanced than late Level 2, it has now become apparent that these differences were not significant.

6.2.4.4 Comparison of Level 3 with early and late Level 2

The most startling of observations was that there seemed not to be any significant difference between Level 3 and either of early or late Level 2 despite that in the rankings Level 3 appeared to have the highest proportion of Perry 'C's and lowest proportions of 'A's and 'B's in most cases. This could only mean that the level of advancement that seemed to have occurred between Levels 2 and 3 in general, had been very minimal. This finding, coupled with the fact that in general there were few instances where the differences between the groups were significant, showed that, as Perry suggested, the movement from one level to another is quite gradual.

It would also appear that the 'sophomore slump' that Grinnell (1987) mentioned is not just a myth, but reality, which needs to be addressed by lecturers and students alike. A look at students' free responses to Part 2 of the questionnaire might shed a light into this problem.

6.2.5 Conclusion on the issue of general Perry 'C' thinking in opposition of Perry 'A' and 'B' attitudes in connection with exams

The fact that Perry 'C' thinking was observed to be popular in all other aspects of students' learning except assessment issues brings us to think that Perry 'C' type of behaviour could possibly be an acknowledgement of what the students think they should be saying rather than the reality observed when they are faced with exams. This could mean that either the exams are out of step with what the students believe they should be, or they are harsh reality.

6.3 Part Two of Questionnaire – Results and Discussion

Results in Section 6.2 gave an idea as to how the perceptions of students in the different levels of undergraduate biology courses compared. In this Section, students' free responses to the second part of the questionnaire were used to try and shed a light on why the trends in Section 6.2 were observed. The statements in this part of the questionnaire were more or less similar to the ones in the first part. It was also hoped that the responses would help explain some of the peculiarities in Part 1 results, such as the 'slump' observed at late Level 2.

The analysis of the results was carried at three different levels. The first part of the analysis dealt with the questions individually. A brief explanation was given as to how the categorisation was done, i.e. why the statements were seen to qualify as the different Perry categories. The results were recorded in Appendixes 7a-f. The different student levels were then compared on the basis of proportions of such categories, for each individual question. In the second part of the analysis, the overall outlook of the results was considered. The questions were therefore looked at collectively, to identify any trends. In the third part, a chi-square statistic was applied to the raw frequencies to find out if the trends observed bore any statistical significance. The results were then compared with those from Section 6.2 to find out if the results could have been reproducible, and to check if further peculiarities could have also been unearthed by the responses.

6.3.1 Item-by-item analysis

As can be observed from the volume of Appendixes 7a-f, Part 2 gave a wealth of information. The students' and staff's responses to Part 2 questions were categorised according to the Perry categories they qualified as. The proportions of responses under the different Perry categories were determined and the results are summarised in Table 6.5 on the next page. Statements from the Appendices were, however, extracted to illustrate findings. It should be noted that summing up the proportions of the categories for each question in Appendix 7 would not necessarily give 100% as might be expected. It would in most cases give a value above this. This is due to the fact that in some cases, a single student would give an answer consisting of more than one statement, which would then be appropriately broken up. However, such cases were taken into consideration when Table 6.5 was drawn. This made sure, for instance, that one student giving three Perry 'C' statements was not counted as three Perry 'C' students.

It also has to be noted that in some cases some students gave statements belonging to more than one Perry category in an answer to one question. In such cases both categories were recorded in the relevant Appendix, with the dominant category highlighted in **bold**. It was this dominant category that was then used in Table 6.5.

In some cases, the students gave responses that clearly indicated that they had misconstrued the questions. This was also indicated in both the Appendixes and Table 6.5. Possible reasons why such questions could have been misconstrued are discussed under the treatment of each question. In some cases, the students would just agree or disagree with a statement and not justify their decision. Such responses were then categorised accordingly, depending on whether the statement was Perry 'A' or 'C'. These proportions are shown in *Italics* in Table 6.5.

TABLE 6.5: Proportions of Students in the Different Level s at GU giving Statements Falling Under the Different Perry Categories – Part 2

LEVEL	POSITION 'A'	POSITION 'B'	POSITION 'C'	OTHER CATEGORIES
Q1				
L1	19.50 + *3.69* = **23.19**	17.28 + *0.00* = 17.28	58.05 + *0.30* = 58.35	1.18 (Q misconstrued)
L2e	9.18 + *4.59* = 13.77	22.96 + *4.08* = 27.04	55.10 + *4.08* = 59.18	
L2l	12.96 + *5.56* = 18.52	31.48 + *3.70* = 35.18	44.44 + *0.00* = 44.44	1.85 (Q misconstrued)
L3	7.89 + *2.63* = 10.52	52.63 + *0.00* = **52.63**	34.21 + *0.00*= **34.21**	2.63 (Q misconstrued)
L4	1.85 + *1.85* = 3.70	20.37 + *1.85* = 22.22	68.52 + *5.55*= 74.07	
Staff	0.00 + *5.00* = 5.00	26.67 + *1.67* = 28.33	65.00 + *1.67* = 66.67	
Q2				
L1	9.60 + *1.33* = 10.93	10.64 + *3.25* = 13.89	59.68 + *4.87* = 64.55	10.64 (Q misconstrued)
L2e	7.65 + *0.51* = 8.16	15.82 = *2.55* = 18.57	67.35 + *6.12* = 73.47	
L2l	5.56 + *0.00* = 5.56	20.37 + *3.70* = **24.07**	66.67 + *3.70* = **70.37**	
L3	10.53 + *7.89* = **18.42**	10.53 + *0.00* = 10.53	71.05 + *0.00* = 71.05	
L4	7.41 + *0.00* = 7.41	12.96 + *0.00* = 12.96	74.07 + *5.56* = 79.63	
Staff	5.00 + *1.67* = 6.67	20.00 + *0.00* = 20.00	71.66 + *1.67* = 73.33	
Q3				
L1	2.36 + *0.44* = 2.80	7.24 + *2.81*= 10.05	80.80 + *5.32* = 86.12	1.03 (Q misconstrued)
L2e	1.02 + *0.00* = 1.02	3.06 + *3.06* = 6.12	78.06 + *13.76* = 90.82	2.04 (Q misconstrued)
L2l	3.70 + *0.00* = **3.70**	7.41 + *3.70* = **11.11**	75.93 + *9.26* = **85.19**	
L3	2.63 + *0.00* = 2.63	7.89 + *0.00* = 7.89	78.95 + *10.52* = 89.47	
L4	0.00	1.85 + *0.00* = 1.85	87.04 + *7.41* = 94.45	3.70 (Q misconstrued)
Staff	3.33 + *0.00* = 3.33	18.33 + *3.33* = 21.66	31.66 + *1.67* = 33.33	40(Q misconst.)/1.67(?)
Q4				
L1	6.94 + *0.59* = 7.53	13.44 + *2.66* = 16.10	69.57 + *6.65* = 76.22	0.15 (Q misconstrued)
L2e	2.55 + *0.51* = 3.06	23.47 + *5.61* = 29.08	53.57 + *13.78* = 67.35	0.51 (Q misconstrued)
L2l	3.70 + *3.70* = 7.40	42.59 + *3.70* = **46.29**	40.74 + *5.56* + **46.30**	
L3	7.89 + *0.00* = **7.89**	18.42 + *5.26* = 23.68	55.26 + *13.16* = 68.42	
L4	3.71 + *0.00* = 3.71	16.66 + *1.85* = 18.51	66.67 + *9.26* = 75.93	1.85 (Q misconstrued)
Staff	0.00 + *3.33* = 3.33	11.67 + *0.00* = 11.67	81.67 + *3.33* = 85.00	
Q 5				
L1	6.65 + *3.54* = 10.19	37.22 + *3.40* = 40.62	38.40 + *3.54* = 41.94	7.24 (Q misconstrued)
L2e	7.14 + *5.10* = 12.24	36.73 + *9.18* = 45.91	28.57 + *6.12* = 34.69	7.14 (Q misconstrued)
L2l	5.56 + *7.41* = **12.96**	48.15 + *5.56* = **53.70**	24.07 + *3.70* = **27.78**	5.56 (Q misconstrued)
L3	2.63 + *7.89* = 10.52	47.37 + *2.63* = 50.00	31.58 + *0.00* = 31.58	7.89 (Q misconstrued)
L4	0.00 + *7.41* = 7.41	20.37 + *1.85* = 22.22	59.25 + *1.85* = 61.11	9.26 (Q misconstrued)
Staff	10.00 + *1.67* = 11.67	6.67 + *8.33* = 15.00	61.67 + *3.33* = 65.00	8.33 (?)
Q6				
L1	3.84 + *1.03* = 4.87	11.67 + *5.32* = 16.99	36.34 + *4.58* = 40.92	37.22 (either A or C)
L2e	16.84 + *11.22* = **28.06**	34.18 + *7.65* = 41.84	24.49 + *5.10* = 29.59	0.51 (?)
L2l	11.11 + *3.70* = 14.81	48.15 + *7.41* = **55.56**	20.37 + *7.41* = **27.78**	1.85 (?)
L3	15.79 + *5.26* = 21.05	31.58 + *0.00* = 31.58	39.47 + *7.89* = 47.37	
L4	20.37 + *7.41* = 27.78	25.93 + *5.56* = 31.48	35.18 + *5.56* = 40.74	
Staff	Not for categorisation	into Perry positions,	but for giving info.	about usual practice.

The numbers in **bold** are the highest proportions of Perry 'A' and 'B', and the lowest proportions of Perry 'C' in each question. Their significance will be discussed later.

As already stated, the discussion of each question requires reference to both Appendix 7 and Table 6.5 above. Before any discussion on the distributions of Perry 'A', 'B', and 'C' statements is done, cases where the questions were seen to have been misconstrued are looked at.

Question 1

> Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.

Misinterpretation of Question 1

Fortunately very low proportions of students misconstrued this question (see Table 6.5). The following statements bear evidence to this misinterpretation:

- It would be boring, labs make it more interesting.
- Do not need lectures only, practical work necessary to do as well.

The students seemed not to conceive that the question intended to ask how much independent work they thought was necessary. They appeared to have thought that the statement referred only to classroom interaction, and not other forms of interactions with their instructors. On the other hand, one could argue that these students could genuinely not perceive that they were expected to work any further than what they did with instructors. As a result, they would only imagine that if exams and tests were not based solely on lectures, the other possibilities would be labs, and by no means work done independently.

Brief discussion of the general outlook of distributions

A browse through Appendix 7a shows that all the three main Perry categories, 'A', 'B', and 'C', are represented at each level. A look at the proportions of the categories would therefore give an idea as to which level was more 'advanced' than the others in as far as this aspect is concerned. The Perry 'C' category seemed to be the most dominant category at all levels, except Level 3, where Perry 'B' dominated. This inadvertently shows that all the groups did not believe in being rewarded for regurgitation without own input, a finding already made in Section 6.2.

Before the actual rankings are looked at, reasons for categorisation of the statements are first offered.

Perry 'A' statements in Question 1

From appendix 7a, it can be seen that statements were categorised as Perry 'A' because the students:

- regarded absorption of lecture material as diligence and therefore felt it deserved rewarding
- felt lecturers' were there to hand over exam material to them, as it was their job.
- regarded regurgitation as evidence of 'understanding' what lecturers taught
- thought regurgitation showed 'knowing' one's stuff
- thought that this was just the way things should be

It was observed that this position was the least represented at all levels, except Level 1 (See Table 6.5). All the proportions, including that at Level 1, were lower than 25% though. This was a rather positive observation in that it showed that as the students progress through their courses, they recognise the need to be more independent from their lecturers. For the Level 1 students to want to be more dependent on lecturers is not a surprise as they are as yet still learning to wean themselves off instructors. There were some statements however, made, mostly by Level 1 students, that alluded to the fact that students might have had been encouraged to be over-dependent on lecturers to pass their exams. These statements were marked in triple-asterisks (***) in Appendix 7a. Such statements included the following:

- All or most of what one needs for exams and tests is said in lectures, this is what the system asks for, therefore one has to oblige.
- Usually, not so much is required to pass, the basics are enough.
- Exams are fact-based and in Multiple-choice format.
- Biology tests memory.

Even though one could take comfort in the fact that relatively low proportions of students at Level 1 said these statements, it is still a worry that, if true, this is practised at university level. One would hope that students are encouraged, as early as possible, to take responsibility for their learning. It is quite evident that students read the exam format as indicating what is expected of them, and would therefore not be bothered to do any more than they think is necessary for them. Even though this could probably not have much significance, it leads one to think of the observation made in Q9 of Part 1, which dealt with exam format, where students and staff seemed not too sure of which format was best for assessment.

It was also observed that there were very low Perry 'A' statements at Level 3 and Level 4. The rank-order of increasing Perry 'A' proportions is shown below:

Level 4(3.70%) < Level 3(10.52%) < early Level 2 (13.77%) < late Level 2 (18.52%) < Level 1 (23.19%)

This could either mean that the students at Levels 3 and 4 were mature enough to want to have more input in their own studies, or that the exam system might have been different from that used at the lower levels. The rank-order also shows that the late Level 2 group was less 'advanced' than the early Level 2 group as it registered a higher proportion of Perry 'A' thinkers. This supports the observation made in Part 1.

Perry 'B' statements in Question 1

More Perry 'B' statements were recorded than Perry 'A's, especially for Level 3. Though this might have indicated that the students were above the Perry 'A' category, these results were a worry because they indicated that the students were not quite sure if relying heavily on lecturers to pass exams was good or bad. Some of the reasons why the statements were categorised as Perry 'B' are given below. From the statements, it was apparent that the students thought:

- they had to be given clear indications of what to read so that they could read if they wanted to pass.
- there was too much work to be covered in little time.
- biology was too diverse for them to know where to look and what to look for
- further reading might be difficult because it is hard to get hold of books in the library.
- examining on material not taught would be unfair.

These reasons give an impression that the students have not yet assumed full independence and still want to rely on the lectures for information. It is apparent that the students do not yet know the 'right process' for looking for information on their own. The students seem to be unable to select relevant information properly on their own. As a result, they end up feeling either that there is too much information to cope with in little time, too much information 'out there' to know where to start and what to look for, or that the relevant literature is simply not available. These are typical Perry 'B' types of thoughts, that seem to echo a sense of despair. As Perry states, it is also normal for Perry 'B' thinkers to be most concerned about fairness in assessments. For students to move from Perry 'A' to Perry 'C' thinking, it is inevitable that they pass through this Perry 'B' phase.

Once again, one could argue that some of the students might have been 'forced' into Perry 'B' type of thinking by the way things are done. The statements below serve to illustrate this assumption:

- Though some questions might require reading or lectures are just the skeleton for study, lecture material is usually enough to guarantee success.
- Required information is covered in lectures, learning is difficult as it is, so no need to bother with unnecessary bits.

Obviously if students discover that they are presented with everything they need for exams, they are not going to push themselves any further. This kind of system can be said to lack in offering the necessary challenges that are essential for promoting intellectual growth in students. Perry 'B' students are happy to live without challenges, even though they might know they need to do their own work.

The rank-order for Perry 'B' proportion for this question was as follows:

Level 1(17.28%) < Level 4 (22.22%) < early Level 2(27.04) < late Level 2(35.18%) < Level 3 (52.63%)

It was no surprise that Level 1 came out with the lowest proportion of Perry 'B's. This could be attributed to the tendency for 'less mature' students to be quite confident of the choices they make. What came out as a surprise though was the finding that Level 3 students were the most unsure of how much input they have to have in their learning. This was mostly surprising in that this trend was not detected in a similar question (Q1) in Part 1. The only question in Part 1 that had a slight indication of dominance of Perry 'B's in Level 3 was Q5. In this question, the students seemed to be unsure of how much challenge the lecturers should introduce in class. It would appear that the one thing that these two questions have in common is the 'challenge' issue.

One could think that the reason why the Level 3 students were not happy about challenges could have something to do with the fact that they had experienced a lot of it in their studies. As such, they would prefer not to have too much of it, just for the sake of making life easier for them. However, one would probably then expect the Level 4 students, with the most experience, to be worse than the Level 3 students, which was not the case. On the other hand, one could argue that the Level 4 students had come to value the challenges more with practice.

The results in Appendix 7a were further scrutinised to try and find answers to this puzzle. There seemed to be an obvious trend in the results. Level 3 Perry 'B' proportions seemed to be higher mostly in statements to the effect that passing should be possible with lecture material, whereas one would need to do more work to excel. The statements below serve to illustrate this:

- Lecturers should provide all knowledge necessary for passing. Excelling should be up to the student (Perry 'B').
- They should pass easily, but excelling needs more (Perry '**B**/C').
- Although some extra reading is required, the majority of the information should come from lectures so that those who do extra get 'A's while those who do lectures only get 'B's (Perry '**B**/C')
- Exams are based on lectures, so passing possible, but excelling could be ensured by further work, understanding, application, etc. (Perry '**B**/C')

This seemed to indicate that, indeed, the students knew that they had to do more work to pass excellently, but seemed not to have the impetus or motivation to want to do so. This could be due to the reason given above, that these students are still struggling to find their place in the highly challenging university atmosphere. On the other hand, one could argue that the

students might have been disillusioned by the lack of challenges, as the last statements seems to indicate.
The rank-order once again shows that the late Level 2 students were not better than the early Level group. There seemed to be an element of certainty in this trend. However, the statistical treatment would help clarify the extent of this difference.

Perry 'C' statements in Question 1

There were, as already indicated, more Perry 'C' statements at each level than the other categories, except for Level 3. This prevalence gave the impression that the spirit of independent work had been instilled in most of the students. This gives hope as one could think that it would be easier for Perry 'C' thinking to propagate within each level as students interact with each other.

The proportions of Perry 'C' were lower than 50% for late Level 2 and Level 3. This indicates that these levels found it hard to embrace Perry 'C' thinking. One wonders why this was the case. One could speculate that they might have had been disillusioned by experience, as discussed before. Whether this was the case cannot be ascertained absolutely without talking to the students themselves. An attempt at this was made through discussions with some students, and the outcomes will be discussed later.

The Perry 'C' statements in Appendix 7a were thoroughly studied. It was observed that the most popular statement was:

- Further independent research/study is needed to broaden one's knowledge beyond lectures and improve understanding.

Only Level 3 registered a very low percentage of students giving this kind of statement. One could then be led to believe that Level 3 students were not too keen to do independent research, as compared to the others. These students might possibly have had high workloads. This, however, was not possible to confirm since the students did not give this as one of the reasons why they agreed with the statement in the question.

The next popular Perry 'C' statement was:

• Understanding, interpretation, critical analysis, application, problem-solving skills, etc. have to be demonstrated.

This indicated that students from all the four levels valued application of intellectual skills. This statement was the most popular at Level 3, though the proportion of students who wrote it was less than 10%. This issue was worth looking into further, and a closer look revealed that there were two other statements with reference to intellectual skills where Level 3 recorded the highest proportion compared to other levels. These statements were:

• Exams are based on lectures, so passing is possible, but excelling could be ensured by further work, understanding, application, etc.
• Giving back information doesn't show understanding or intelligence.

The first of the above statements implies that though further work was appreciated for its contribution in the development of intellectual skills, it was not necessary to ensure a pass. As a result, one can be led to believe that the Level 3 students appreciated intellectual skills, but were not too keen on doing further work on their own. Another finding served to support this. It was observed that a lower percentage of these students agreed with the following statement, compared to other groups:

• Lecturers should, and only do give skeletal information in class, students need to beef it up.

In addition, though they seemed to appreciate development and exhibition of intellectual skills, none of them wrote the following statement, which other groups did:

• Students should provide their own views and opinions, independent thought and conclusions, to show understanding.

These findings could only serve to corroborate further the assumption that Level 3 students were only aware of their responsibilities and appreciated the need to develop intellectual skills, but did not seem to have the capacity or willingness to engage in independent work. The appearance of Level 3 at the top of the rank-orders in Section 6.2 could therefore be seen to have been a result of these students merely stating what they thought was expected of them in most cases, rather than what they really thought.

Exposure of transitional stages

As expected, this part of the questionnaire did expose evidence that some students were in transitional stages between the Perry categories. Examples are given below, together with the explanations:

- Exam questions refer to lecture material but might be tricky, so understanding of lecture material is crucial.

In this example, the emphasis on 'lecture material' gives an impression that the student is either not willing to look beyond the lecture, or is unaware that they have to do so., rendering them a Perry 'A' type of thinker. At the same time, reference to the 'questions being tricky' gives the impression that the student believes the lecturers are trying to present the questions in a confusing manner, which is the last thing either a Perry 'A' or 'B' thinker wants. Since the students seem to be aware that they need not only absorb information but also understand it, they can be said to be beyond Perry 'A'. However, since the understanding is reserved for lecture material and not more, it could be assumed they are not yet at Perry 'C' level. This therefore places the students between Perry 'A' and 'B'. The Perry 'A' thinking seems to be more dominant than Perry 'B'.

Another example follows:

- Students need to do further reading and add this to their answers, but this would be limited because there is too much to do.

In this case, the fact that further reading is appreciated indicates that the student has an element of Perry 'C' thinking. However, this is immediately countered by a Perry 'B' retort, that not much would be done as there is far too much to do. Though this places the student between Perry 'B' and 'C', Perry 'B' is taken to be the most dominant as it appears the student is not prepared to take up much independent work.

As far as this question is concerned, it can be concluded that, in general, the students had more of a Perry 'C' type of thinking than Perry 'A' or 'B'.

Question 2

> Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes:

While the first question was aimed at finding out how independent the students were prepared to be, this question was directed more into finding out how much they valued working with others as opposed to working in isolation.

Misinterpretation of Question 2

It was observed that a number of Level 1 students were thrown off-course. The way the question was phrased might have caused this. The inclusion of the clause '...and not just confine themselves to lecture notes', might have led the students to believe that absolute independence from lecturers, and/or perhaps cancellation of lectures was being advocated. The following statements from Appendix 7b show this:

- If the question means that lectures are not necessary, then I disagree, because they are vital in providing knowledge, structure and idea of exam content.
- No matter how good you are, there are still questions you can ask the lecturer.
- Though working with other students is good, too much freedom is not necessary.
- Deadlines and assessment remove the fun in learning, therefore freedom is good.
- This gives them the opportunity to work on what appeals to them, but this would mean no proper classes.

It was found that over 10% (10.64% to be precise), fell for this distraction in the question. However, this finding was useful in the sense that the need to re-phrase the question for future purposes was recognised. It was decided that in the final questionnaire this question would be changed to:

- Students could improve their learning if they worked more with their fellow students.

This would hopefully carry the main essence of the question without any distractions. Fortunately, most of the students did get the meaning of the question, and their responses were enough to get the general feeling of what they thought about working with their peers.

Brief discussion of the general trends in the distributions of Perry Categories in Question 2

As in the previous question, Perry 'C' thinking was predominant, and this time, at all levels. Of the three categories Perry 'A' thinking was the least popular, except at Level 3, where it was observed to be more dominant than Perry 'B' thinking. Though the Level 3 Perry 'A' proportion was highest at 18.42%, it was still lower than the critical 25% value established in Part 1.

It was important to try to understand why Level 3 might have dominated the Perry 'A' category. A further look at Table 6.5 revealed that this level registered highest proportions where the students just disagreed with the statement without justifying their decisions. This meant one could not even guess why they disagreed. However, the Perry 'A' statements given by this group all seemed to have something to do with what they might have experienced. The students could have been discouraged by what might have transpired in the past, as the statements below, especially the first one, seem to indicate:

- I don't think any of the group projects we did helped with studying.
- When students work/talk with others, there can be too much debate that can cloud the issue.
- Some students cannot be relied upon.
- Some students work better alone.

Perry 'A' statements in Question 2

In general, the proportions of students giving the different Perry 'A' statements were very low. This means that there was not any one statement in particular that could be said to show what might have influenced the students into not liking group-work. However, it did appear that most of the statements made reference to potential failure due to lack of discipline in students. Examples are given below:

- Not all students participate willingly in groups.

• Generally students are lazy and need coercion to work, they would not do much work under these circumstances.
• This requires too much discipline.
• Some students cannot be relied upon.
• Students are so loud it is impossible to work with them.
• Group-work is not ideal as not everyone pulls his/her weight.
• Working together does not necessarily mean students work any harder, in fact, they might end up doing nothing.

What these statements might be seen to show is that these students had not had the opportunity to be engaged in productive group-work scenarios. Since at the end of the day they are being trained to join a society where they would be expected to work with others, it is unfortunate that they had not learnt the skills of working together, dealing with distractions and motivating themselves and each other. These students need not only be trained in their own self-discipline, they also need to be trained in achieving effective self-discipline within their groups. The issue of self-discipline in well covered in literature. Here are a few ways by which some writers define and describe it:

• Self-discipline is the training of oneself to control one's habits, actions and desires, in other words self-control. Self-discipline is the quality that makes resist the urge to do wrong for self-benefits, control your laziness, suppress your emotions, etc. Self-discipline is to be able to sit down and revise your work rather than watch television. (http://home3.pacific.net.sg/~revere/quaities.html)
• Discipline is a protective force in our lives. Through developing self-discipline we are able to take charge of our lives as opposed to being led astray by uncontrollable drives and emotions. Self-discipline can become as automatic as getting up at a certain time to get to school or to work, doing the laundry on a regular schedule, getting meals ready on time, or setting aside a certain time for doing homework...If we don't develop these habits to help meet our obligations, there can be negative consequences. (http://pages.hotbot.com/edu/orlandi/nov.html)

What these writings show is that self-discipline does not only help us keep our lives at equilibrium, but it also helps us achieve our goals. For many people self-discipline is a very hard thing to achieve, but all it needs is patience. Without effective self-discipline within the team or group, poor norms and behaviours not only arise, but flourish (www.bizcenter.com/effective.htm).

There were other students who seemed to have been more worried about the type of content that might come out of group discussions. For these students, it was quite clear that they did not trust their own and their fellows' knowledge. The statements below serve to illustrate this:

- Students can mislead and confuse each other as they might not have the right knowledge.
- Unsupervised study could lead to misconceptions.
- Lecturers are the first people you look to for information.
- Students might not be able to collect all the correct information.
- It is more beneficial to have someone who knows a lot about the subject to inform you about correct information.

The statements also have an implication that lecturers are highly trusted as 'fountains of knowledge', a typical Perry 'A' characteristic. Lecturers might be seen as such because of the way the education system works. If the students notice that the exam system always asks them to give what are already determined 'right answers' they would automatically not want to have to do with anything that might prove detrimental to their pursuit of these answers. In the statements above, other students are seen as these potential barriers. Multiple-choice tests for instance, though often criticised, continue to be used world-wide. They continue to be used mainly for the purpose of convenience, as they are faster and easier to mark. What they do in essence is to mislead the students. This is what one writer on the Web says about them:

> ...The convenience of the multiple-choice tests (and other tests which have simple right answers) is incontrovertible. But these tests perpetuate the myth that is the crux of what is wrong with today's education system: The Myth of the Right Answer. In a multiple-choice test, there is a right answer. This is rarely true in life, however. In real life, there are nearly right answers, answers that are missing a step, and most important, situations in which there is no right answer at all...(http://movietone.ils.nwu.edu/~e_for_e/nodes/NODE-66-pg.html)

The last two of the students' statements above agree with the idea of the Right Answer System. The writer above continues by stating that:

> ...The Right Answer System insists that there is a single correct answer to every question. Students do not have any control over what the Right Answer is. Answers are doled out by the teacher...(http://movietone.ils.nwu.edu/~e_for_e/nodes/NODE-66pg.html)

The search for 'correct' knowledge might have had something to do with some students' worries about the dynamics of group work. The following statements show that these students seemed to have the idea that there was a certain line of thought to be followed, which could be easily lost in discussions:

- Students easily go off-track during discussions.
- When students work/talk with others, there can be too much debate that can cloud the issue.
- Discussions can be difficult, as students might have had communication problems.

The Perry 'A' ranking of proportions was as follows (see Table 6.5):

Q2 Part 2: Late Level 2 (5.56%) < Level 4 (7.41%) < Early Level 2 (8.16%) < Level 1(10.93%) < Level 3 (18.42%)

It was interesting to observe that the late Level 2 group had the lowest Perry 'A' proportion, a very positive observation since this level seemed to be the least developed according to Part 1 results. However this was countered by the observation that this group had the highest Perry 'B' proportion:

Q2 Part 2: Level 3 (10.53%) < Level 4 (12.96%) <Levell (13.89%) <Early Level 2 (18.57%) <Late Level 2 (24.07%)

One would have expected the rank-order to be somewhat similar to those in Question 6 of Part 1, which also dealt with students working together.

Perry 'A': (Q6 Part1: Level 1 (1.77%) < Level 3 (2.63%) < Level 4 (3.7%) < Early Level 2 (4.59%) < Late Level 2 (5.55%)
Perry 'B': (Q6 Part 1: Late Level 2 (5.56%) < L1 (9.6%) < Level 3 (13.16%) < Level 4 (20.37%) < Early Level 2 (21.94%)

This was not the case, however. The proportions of either Perry 'A' or 'B' were different for each level. This was attributed to the fact that the two parts of the questionnaire could not possibly have had the same level of sensitivity in detecting the students' perceptions due to their different formats. A look at the above rank-orders, for both questions 2 and 6, would reveal that late Level 2 completely switched positions, in each of the Perry 'A' and 'B' rank-orders. This observation made it obvious that there was a difference in what the two questions measured. To give a reminder of the phraseology of the questions, both questions are repeated below:

Q2 Part 1: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes.

Q6 Part 1: It is good to work with students because, by listening to their points of view, I can evaluate my own. / I prefer not to work with other students because then I stand less chance of picking up wrong ideas.

The late Level 2 students registered the lowest proportion of Perry 'A's in Q2 Part 2, and the highest in Q6 Part 1. This means that this group had the highest proportion of students having very little trust in their peers' knowledge, while at the same time they had the lowest proportion of students who thought working with others would have no value in improving one's learning. This could imply that the students were simply not comfortable with working with their peers for reasons beyond lack of trust in their knowledge. The switch observed for Perry 'B' proportions in the rank-orders corroborated this. This level registered the highest proportion of Perry 'B's for Q2 Part 2 and the lowest for Q6 Part 1. This can be taken to imply that these students were more unsure of the benefits of working together as far as improvement of learning is concerned, than they were about the reliability of their peers' knowledge.

Perry 'B' statements in Question 2

Dealing with Perry 'A' thinkers would not be much of a problem if they were to be exposed to situations that could show them the benefits that could come out of group work. Trying to influence positively some of the Perry 'B' thinkers who might already have been disgruntled by their experiences at attempting to embrace the multiplicity faced when working with others could be a little more difficult. Some of these students seemed to see benefiting from group work as something that could not possibly happen in reality. It would be harder, therefore, to deal with this kind of cynicism. Such thoughts came out in statements like:

- It is up to the student to make this choice, but it would not work in reality.
- Theoretically this is a good thing to do, but it would not work in reality.
- Ideally this is helpful, but it is impossible to do.

Some of the Perry 'B' statements however seemed to acknowledge the importance of working together, though they saw many problems that could result in its failure:

- Though this could help students discuss ideas and problems, it could be time consuming.

• Although discussions are important, if they are on the wrong track and don't know the answer within the group, it's easier to get misled.

• People study in different ways, but working with others could still help in developing others' skills.

Most of the statements that qualified as Perry 'B' carried in them an element of Perry 'C' thinking, since they acknowledged the benefits of working together. These statements were as such given a Perry 'B/C' identity in Appendix 7b. There were quite a number of these statements, which showed that the students did have a potential for accepting group work as a very beneficial means to their learning. This also meant that one could foresee a situation where the dominant Perry 'C' thinking could spread throughout the student groups as students do influence each other a lot.

Perry 'C' statements in Question 2

The most popular Perry 'C' statement was:

• Discussions improve understanding and knowledge attainment by sharing of knowledge, ideas, opinions, views, etc. not availed by lecturers.

More than just showing that the students appreciated working together, this showed that they generally saw each other as legitimate information sources. This would tend to support the assumption made in the discussion of the positioning of late Level 2 in the Perry 'A' and 'B' rank-orders. This seems to further proof that most of these students had faith in their peers, but might not have been too keen on working together for other reasons. One of the possible reasons, as already discussed, learnt from experience, is that some students did not put in the necessary effort. Another reason could have been lack of time caused by rather busy schedules.

The Perry 'C' rank-order was also looked at:

Level 4(79.63%) > Early Level 2(73.47%) > Level 3(71.05%) > Late Level 2(70.37%) > Level 1(64.55%)

The fact that late Level 2 produced a lower proportion of Perry 'C' statements than early Level 2 was noted.

Question 3

- Learning by seeing connections between ideas is more effective than absorbing isolated facts.

Misinterpretation of Question 3

This was a fairly straightforward statement that one would expect to make sense to almost everyone one at university level. There were some students however, who seemed to have had misconstrued this question. The following statements emerged:

- What one sees or hears sticks better in the mind than hearsay.
- Lectures involving seeing things, e.g. slide shows, are more interesting.
- Having done something in practice makes it easier to work on.
- Labs are good because one gets to see things for themselves.

The distracter appeared to have been the word 'seeing' in the statement. Though very low proportions of students were misled in this question, it was necessary to consider re-phrasing the question for future use. It was hoped that the question suggested below would be a suitable replacement:

- One would learn better by finding out how ideas connect together than by trying to learn them separately.

General feel of the results

Though some students might have misconstrued the question, the majority of the students gave a wealth of statements that were analysed. The highest proportions of Perry 'C' and the lowest of both Perry 'A' and 'B' statements were recorded here than in any other question. This meant that the question stated something with which most of the students, in all these levels, agreed. The results were similar to those for Q7 of Part 1, which had the following opposing statements:

- All one has to do in biology is to memorise things. *versus*
- Instead of memorising things it is interesting to look for patterns and relationships among facts.

Table 6.1g (Section 6.2) and Table 6.5 (Section 6.3) show that Q7 Part 1 registered higher Perry 'A' proportions than Q3 Part 2 (L1: 16.4% vs. 2.80%; L2e: 3.06% vs. 1.02%; L2l: 7.41% vs. 5.56%), except for Levels 3 and 4. At these levels, no Perry 'A' statements were registered for Q7 Part 1. The same situation was observed for Perry 'B', with the exception of Level 3 only. It would make sense for the lower levels to be more in agreement with memorisation, because of the type of exams they might have been made to sit (multiple-choice), as this statement from Q1 Part 2 revealed:

- Many exams are based on memorisation, so one has to do it.

The lower percentages of Perry 'A' statements for Q3 Part 2 compared to Q7 Part 1 could have had something to do with the way the question was phrased, and what the students might have thought it meant. The former asked the students whether they practised memorisation in learning biology, while the latter questioned whether this practice would be effective if employed. If the exams were indeed in multiple-choice format, it then makes sense that a higher percentage of students would have stated that all they had to do in biology was to memorise things. Lower percentages would agree to this method being effective, if they did not see much benefit in it.

Even though the Perry 'A' and 'B' proportions for Q3 were so low that the rankings would seem too trivial to mention, the fact that late Level 2 had the highest for both was worth mentioning. The Perry 'B' proportions were also seen to be higher than Perry 'A' proportions at all levels.

Perry 'B' statements in Question 3

The most popular Perry 'B' statements, according to Appendix 7c, were those alluding to the benefit of using both methods, as the following statements seem to imply:

- Both methods are equally effective, depends on topic or assessment format.
- One need to employ both methods.
- Connections are good, but one needs to know the facts before connecting ideas.
- Memorising isolated facts is fine, but one has to know what they mean by making connections.

The fact that some students make reference to assessment format is crucial evidence to the effect that students read the assessment format as spelling out what they should be doing in their learning. The last two statements also represented cases where the students felt that both methods were necessary, but felt that one took precedence over the other, as it was a prerequisite to the implementation of the other.

Perry 'C' statements in Question 3

Amongst the many different types of Perry 'C' statements given the most popular was:

- It is easier to remember, and not easy to forget ideas that are logically connected since there are less things to remember.

This was a fairly obvious statement from the information processing point of view. Many students might have picked this up from experience or through psychological studies. The other common statements were:

- Logical connections between ideas ensure and demonstrate more effective understanding. Learning and knowledge attainment than simple memorisation.
- One can easily get confused when memorising, while understanding makes learning easier and better.
- One can be able to build the entire picture and relate things to one another, or relate things that are known to those unknown.
- Connecting ideas makes learning much more interesting, while isolated facts are boring.

While these statements might have appeared as common sense, they actually carry a psychological perspective to them. The important issue here, however, is that most students were aware of the benefits of linking information, and so all they needed to be asked was to apply themselves in tasks demanding this operation. Giving them Multiple-choice questions does not quite present this opportunity, and as such deprives them of the necessary challenges they seem ready to meet.

It was observed that the levels that have shown signs of being more advanced so far (Levels 4, 3 and early Level 2), seemed to be more prepared to take up tasks requiring the application of advanced intellectual skills than the less advanced late Level 2 and Level 1 groups. The statement below, with its accompanying rank-order, proved this:

• Making connections allows demonstration of creative thinking, critical analysis, interpretation, reasoning, application, etc.

Level 3 (7.89%) > Level 4 (7.41%) > early Level 2 (4.08%) > Level 1 (2.52%) > late Level 2 (1.85%)

The 'sophomore slump' was once again, detected.

Question 4

• Lecturers are not there to give students all the information they need, they are there to guide them in their learning.

General outlook of Question 4 results

It has already been established that the students at all four levels generally had predominantly Perry 'C' thinking in relation to the extent to which they would like to depend on their lectures, meaning, they prefer not to be too dependent on the lecturers. This was therefore the expected outcome in this question, and it was observed. Perry 'C' proportions came out higher than either of Perry 'A' or Perry 'B' ones.

Misinterpretation of Question 4

As with all the other questions, there were some students who seemed to have misconstrued the question. Their statements were as follows:

• This is true, lecturers are the only people to guide students.
• If a student approaches a lecturer and asks specifically for certain information, it would be rude for the lecturer to refuse.
• Students can choose what subjects they are interested in to explore then further.
• Students need the lecture notes, once you have lecture notes, they can expand on them.

While the statements might sound sensible at first glance, they are not particularly in line with the theme of the question. For the first two statements, it was almost impossible to determine what might have made the students think about these statements. When one pays closer attention though, the meaning of the statements can almost be 'felt'. In both cases, it sounds as if the students might have felt that they were not getting enough of the guidance they felt they deserved. In the first statement, this might have even made the student overlook the first part of the question, which carried its whole essence. The second statement appeared to have come from a student who was not too keen to be left to fend for him/herself, and felt he/she needed and deserved help from the lecturers.

In the third statement, it was clear that the student might have imagined a scenario totally devoid of lectures, which was not what the question implied. The statement carried a Perry 'C' sound to it, as the student thought of 'exploring subjects further', but at the end of the day, it seemed to imply that the student would be happy in an environment free from lecturers and lectures. In the last statement, the student might have interpreted the question as meaning that the lecturers were not going to do any lecturing at all. Though the statement might have also carried a Perry 'C' connotation to it, it was noted that the student misread or misinterpreted the question.

Considering that some students did misconstrue the question, it was advisable to think of an alternative statement for the next questionnaire, and this is what was suggested:

- Lecturers are not supposed to supply students with all the information they need.

Perry 'A' statements in Question 4

As in the other questions, the cases of misinterpretation were minute, compared to the proportion of students who provided relevant responses. Some very interesting statements were gathered, especially in the Perry 'A' category. This category was not the most popular, but the responses were worth paying attention to. Some typically Perry 'A' statements emerged here, for instance:

- Lecturers should supply students with all the necessary material and help.

• Lecturers are the ones with the greatest depth of knowledge and are there to teach us.
• Lecturers must supply students with material on which they will be tested or examined.
• Lecturers have a responsibility to teach effectively.
• It is helpful to be taught and inspired by someone else.
• It is their job to tell us what to learn and what is needed to pass with an 'A' grade, and they are paid for it, so they should do it.
• Lecturers should be very specific on the curriculum and tell you what you need to know exactly.
• Lecturers should not be lazy.

Though these statements did come out quite strongly, the fact that they were written by a very low proportion of students, mainly at Level 1, should be considered. One should also bear in mind Perry's assertion that students who have recently entered university are usually quickly encouraged away Perry 'A' thinking by interacting with others. The students might have also been made to feel this way by the frustration of not being able to deal with multiplicity in their attempts at independent study. Some of the students voiced this in their statements:

• If course content is not detailed, students can be misled in discussion or personal study.
• Students would waste time learning irrelevant facts if they didn't know exactly what they are meant to learn.
• It is easier to learn when supplied with all the material. One would otherwise learn the wrong things.
• As well as providing facts, they could also help them to learn in better ways.
• Some teaching is essential because you must identify the truth from what isn't.
• Students may have conflicting views.

These statements were given a partial Perry 'B' identification as they showed that the students were somewhat worried with the process of information gathering, and were not quite sure of how to conduct this. The fact that in the end the students preferred to be given detailed information by lectures rendered them Perry 'A' thinkers.

Perry 'B' statements in Question 4

The tone of the statements above differed somewhat from those identified as Perry 'B' ones in that in the latter, the students seemed to be aware that they were not necessarily supposed to be supplied with everything. In most of these cases, other sources were acknowledged as possibly holding the necessary information. The students seemed to need to be shown the right processes of selecting relevant information, as some of the statements below show:

• Lecturers should not only inform students what to take from lectures, but also where to get own extra information.

• Lecturers should guide students, but they should also make students aware if what they are telling is only a side of the story.

• Lecturers should give the majority of the information and guide the students to extra.

• Lecturers should tell students where information could be found. Sometimes there is just so much that students don't know where to start.

• They have to tell you what to learn, otherwise you either learn too much or too little, depending on sources used.

While the students who wrote the above statements might have hinted at their inability to look for relevant information on their own, others gave some reasons like high work loads, time constraints and lack of sources as being detrimental to their learning:

• Lecturers should be aware of students' other courses. Even though they shouldn't spoon-feed them, they should tell them what's required of them.

• Lecturers should supply all the information, students have too much to do to find time to do further studying on their own.

• This penalises students who lack access to the resources (internet, etc.) in private.

• Exams would be unfair as some people might not have had the privilege to find the information while others might have.

• Even though students should be guided instead of being given all the information, it would be unfair for other students to get marks for having read a specific paper that others might not have seen.

Another common feature to the statements above, and some of the other Perry 'B' statements in Appendix 7d, is the issue of fairness in assessment, which as stated before, Perry identified as being common in Perry 'B' thinkers.

There were also some statements that implied that students were not encouraged, in one or the other, to learn how to find the relevant information on their own.

• It's always useful to get extra information yourself, but usually, lecturers provide all the information needed.

• This is true, but often tests (at Level 2 anyway) only need knowledge of lecture material to get an 'A' grade.

• They give page numbers to study, etc., so they do in a way help guide to learn.

• Lecturers give students limited information, but also page references to textbooks to guide students.

The first two statements, if true, show that the students were not presented with any challenges at all. This would inevitably force the students to stay at a level below what they know they could possibly achieve on their own, as they do not find the need to work harder. The last two statements imply that even though the students might have been asked to read further, the challenge of having to look for their own material was removed by giving 'specific page references'. Though the lecturers in this case, might have done all this with good intentions, it could end up being more destructive than beneficial to the students in the long run. After university, there would be no one to tell them exactly where to look for information.

The Perry 'B' proportions were found to be quite high compared to Perry 'A' ones (see Table 6.5), almost as in Q1, but in this case late Level 2 had the highest proportion instead of Level 3.

Perry 'C' statements in Question 4

Late Level 2 continued to occupy the same position as the least advanced by registering the lowest Perry 'C' proportion, below 50%. The other groups however, registered fairly high proportions over 65%. Level 4 still registered the highest proportion.

There were different reasons why the statements were categorised as Perry 'C'. It was surprising to find out that the most popular of these had some consideration of the fact that lecturers did not have enough time at their disposal to teach everything:

- It is impossible to provide all the information during lectures.

Though this might not say whether the students were happy with this or not, the second most popular statement, and all the others relating to it, gave an impression of the general feeling that they found this acceptable:

- Lecturers should, and only just provide the skeleton and leave students to beef it up.
- Lecturers should indicate what should be looked at, but not necessarily go into detail.
- Some points are not covered in enough detail in lectures, so they need to be supplemented by other knowledge.
- Lecturers should give the main/important points with reference material for students to do further research on the topic.
- Lecturers should highlight important issues and current research, leaving facts to be learnt from textbooks.
- The textbook is where most of the course information should be found.

The students were clearly aware that they had to assume the responsibility of looking for their own information after lectures. These students indicated that they wanted to know more and were ready to discover knowledge themselves, factors characteristic of 'High Quality Learning', according to Nightingale and O'Neil (1994). This also characterises them as typical Perry 'C' students.

In the last three statements, however, it can be seen that the students had a limited scope as to what comprised further reading. Though textbooks and references given by lecturers could be taken to be sources of further reading, the students should be prepared to venture beyond that into sources they could identify on their own with their knowledge of the course outlines. This would define 'research' better. It is the ability to do independent searches that makes a good researcher. This knowledge would be even more beneficial to them in the future. Courses in higher education should be aiming to teach skills that students will need later in their careers. By inviting them to think as independently as possible and to reach their own conclusions, they are being prepared for what they will need to do in their future careers, according to Grinnell (1987). Some students seemed to support this thinking by stating that:

- After graduation, one would have to know how to learn and think, not how to recite facts.
- Independent learners make better researchers in the future.
- Students need to learn skills needed after university.
- Students should be encouraged to do outside reading because understanding more will give them an advantage in the future.
- This prepares students for the future (decision-making, etc.)

Science as a career is not only about how intelligent you are. It requires thought and ability to learn outwith acquired knowledge.

Other statements qualified as Perry 'C' for a plethora of reasons. Appendix 7d shows that the students thought of the following:

- Students should show initiative themselves.
- Finding information independently expands knowledge.
- students should be encouraged to think of wider issues.
- Students should be able to develop their own learning and study techniques.
- Independent work makes the work more interesting and motivating.
- A good lecturer is one who stimulates desire for greater knowledge and enthusiasm in students.

- Information sought independently is easier to remember and not easy to forget.

Most of the above statements fall under characteristics of 'High Quality Learning suggested by Nightingale and O'Neil (1994). They outlined these as (i) being able to discover knowledge for oneself, (ii) long-term retention of knowledge, (iii) being able to perceive relations between old knowledge and new, (iv) being able to apply one's knowledge to solving problems, (v) being able to communicate one's knowledge, and (vi) one's wanting to know more.

There were other statements that indicated that the students were aware that there had to be a difference between their responsibilities and those of school children:

- It is not school, so students have to think for themselves.
- Unlike at school, students at university are able to look some things up themselves.
- This is what university is all about.
- University students are old enough to do independent research.
- Lecturers lecture, teachers teach.

One student even thought about the nature of scientific knowledge, and the need for students to keep abreast with this:

- Information is continuously changing, so students need to keep themselves informed all the time and be able to learn to think critically on their own.

All these statements indicate that the students were ready to function at high levels of the Perry scheme. All they needed were the appropriate challenges from lecturers, in the form of suitable assessments and activities.

Question 5

- Examinations should be confined only to what was taught.

General outlook of the distributions of Perry categories in Question 5

The volume of Appendix 7e gives an idea of how the students felt about this statement. Since this question dealt with the issue of exam content, it was expected that a change in the distributions of Perry categories would change, as observed in Part 1. It was expected that the distributions would be somewhat similar to those observed in Q10 of Part 1, which bore the following statements:

Perry 'A': In exams I prefer questions which are based on what the lecturer taught.

Perry 'C': In exams, I prefer questions that demand thinking beyond what is taught in class.

Q10 Part 1 gave distributions that were predominantly Perry 'A' (see Table 6.1j & Figure 6.1j). In this question however, Perry 'B' came out dominant at all levels, except for Level 1, where it was almost equally dominant as Perry 'C'. A closer look at these questions indicates that this question dealt with ***what** the students think* ***should be** in exams*. On the other hand, Q10 Part 1 asked students ***what they would prefer** to find in exams*. The latter asked the students to state their ideal situation, and being students who would like to pass with as little hassle as possible, it is understandable that they opted for the easier route to passing. What this shows is that the students were aware that exams should not be based entirely on what is taught, even though they preferred that as it would make life easier for them. One can the understand why a Perry 'B' standpoint would dominate, they knew what should be the case, but were sure if this would not make life easier for them.

Misinterpretation of Question 5

Before the individual categories are discussed, one has to note that this question seemed to be the most misconstrued by students at all levels, according to Table 6.5. What was eve stranger was that the levels that would have been thought to be the most advanced, according to Perry 'C' proportions recorded, were the ones that had the highest proportions that misconstrued the question. The 'usually' least advanced late Level 2 registered the lowest proportion of such instances of misinterpretation.

The statements in Appendix 7e indicated that the problem might have lied with what the students thought the questions implied. Some students seemed to think that the statement implied that it was possible to include material not in the syllabus or taught subject:

- There is enough for students to learn in the course without being examined on extra material they may not even know about.
- It would be easier if it were just subjects taught.

• I disagree, things should be broader, but I do wouldn't like to see a question in Quantum-Chromo-Dynamics popping in my ecology exam.
• Throwing in questions not in the course is a bit unfair,
• Exams are to test in certain areas of study (syllabus), and this should be stuck to, otherwise it would be unfair.
• Not all students have time to study things that were not in the course.

Some students even thought that the question implied that students should be examined on general knowledge, as these statements show:

• Exams are not meant to be testing students on general knowledge.
• If not, this would be more of a general knowledge quiz.
• Students spend time studying what they believe they have to know, not on general extra material.

Though the proportions of students misinterpreting the question were all lower than 10%, it was important to try and find a way round the problem. An alternative statement was suggested:

• Examinations should contain only the material taught by lecturers in class.

Perry 'A' statements in Question 5

Apart from the fact that there were those students who misconstrued the question, it was pleasing to find out that Perry 'A' statements were least popular. The following typically Perry 'A' statements were extracted from Appendix 7e:

• In practice, students study, understand and have knowledge only on what they are taught told to study.
• Students cannot be expected to learn things they haven't been told.
• Students should know exactly what they are expected to reproduce in exams.
• Students only learn basics, and would not search for extra.
• The definition of exam is a test of what someone has been taught.
• There is no point in teaching students if what is taught is not detailed enough to use in exams.

Some students seemed, once again, might have been victims of an unchallenging system, as the following statements indicated:

• There are set marking schemes that do not include any extra knowledge, so learning this would be a complete waste of time.
• when marking exams, lecturers love to read what they have taught, so this is important.
• There is no point in having a textbook if all you need is in your notes.

One should not forget, however, that these might have been what the students thought, but not necessarily what the lecturers themselves wanted. The only consolation is that not all students felt this way, and they showed that they knew not to restrict themselves to lecture material.

Late Level 2, once again showed that it was probably the least advanced of all the levels by registering the highest Perry 'A' proportion:

Level 4(7.41%) < Level 1 (10.19%) < Level 3 (10.52%) < early Level 2 (12.24%) < late Level 2 (12.96%)

Perry 'B' statements in Question 5

Perry 'B' statements qualified as such for reasons already discussed in the other questions. The reasons included quest for fairness in assessment, complaints about time constraints, and lack of resources. This, once again, indicated an overall lack of knowledge of how to look for and select the relevant information. The issue of fairness was mostly intriguing, especially where the students felt even those who did not do work deserved fairness, and where equal opportunities seemed to be sought:

• All students should stand a fair chance, even those who do not have extra knowledge.
• This gives everyone a fair chance of passing.
• All students should have a fair chance to pass.
• All students should learn the same material.
• A fair medium is necessary.

The above statements had an element of Perry 'A' thinking in them, hence they were given a Perry 'A/B' identity. The students sounded almost 'innocent', as if they did not know that was not supposed to be the case, an almost child-like stand-point. Such a character is usually observed in Perry 'A' thinkers, according to Perry.

Examples of purely Perry 'B' statements from Appendix 7e are given below:

• This would allow students to know what they would be tested on, otherwise they would overburden themselves with irrelevant material and fail.
• There is too much material in lectures as it is, but not enough time.
• There are too many subjects and too much to learn in 2nd Year to spend time learning more.
• There is too much information 'out there' for students to know what to learn.
• Not everyone can get hold of books in time.

Recognising their inability to look for their own information, some students suggested that they be 'directed' to certain sources:

• Exams should cover what was taught and what students were referred to.
• Basing exams on taught material is okay as long as 'taught' includes prescribed reading.
• Exams should be based only on what was taught. If further knowledge is going to be examined however, I believe reference should be made to where it can be found.

Though this might sound quite strict, if students are to do further reading only if given prescribed reading, then this does not amount to much independence. Giving references is acceptable, but it should not be the only basis for further research. References should be given only if there is specific material that the lecturer thinks the students should really consult, because there are many other sources that can be consulted. Depending too much on the prescribed reading results in complaints of 'shortage of books' 'not being able to get hold books on time', that were quoted before.

Some students pleaded that they be given for low amounts of work to do independently:

• As long as the extra material is not vast, it should be studied, as an interest in the subject helps.
• Background and extra knowledge should be examined, but to a small degree.
• It can also include the reading or extra concepts which lecturers indicate, but not in excessive amounts.
• A little extra knowledge questions in exams are challenging, as long as these are not too many.
• There should be a relative amount of extra-curricular material, but not an overpowering amount.

These statements indicate that the students feel 'swamped' with an overwhelming amount of work to deal with, which, as indicated, lends itself to the issue of not knowing how to select relevant information. The last statement also made reference to 'extra-curricular' material. It appeared like this term was used to denote any work done outside lectures, which in essence is curricular material. This seemed to be common usage of this term, as seen from the statement below:

• Though extra-curricular learning should be merited, it would be unfair to question students on something unfamiliar. A course should encompass all the relevant issues on a topic. Extra curricular work will benefit them on the taught subject by increasing understanding.

Some of the statements above were given a Perry 'B/C' identity as they contained issues pertaining to time constraints and volume of work, yet the students seemed to appreciate the need to read further.

There were also some statements categorised as either Perry 'B' or Perry 'B/C' that could have as easily been cases of misinterpretation. Their positions are shown in ***bold-type Italics*** in Appendix 7e:

• This would be unfair because not every student can afford to spend time on extra biology study.
• Students should be assessed on their coursework, otherwise it would unfair on those without access to further reading or motivation.
• It would be unfair to ask about something never mentioned before, unless it was closely related to a topic.
• Students should only answer relatively to the answer, and not extend the facts too much.

Late Level 2 students, once again, had the highest Perry 'B' proportions:

Level 4 (22.22%) < Level 1 (40.62%) < early level 2 (45.91%) < Level 3 (50.00%) < late Level 2 (53.70%)

Perry 'C' statements in Question 5

Perry 'C' statements given centred around the issues of advanced intellectual tasks; expansion of knowledge; use of own initiative, ingenuity and original thought; assumption of responsibility and independence; need for challenges; use of own opinions and views; acknowledgement of preparation for future, etc. Examples are given below:

• Exams should include other things closely related to what was taught to test skills of reasoning, evaluation, deduction, problem-solving, application, scientific thinking, etc.
• Students should display initiative and evidence of further learning.
• There should be questions to examine any wider knowledge.

• Exams should allow a student to be creative, to exhibit talent and initiative, and this should be rewarded.

• Exams should be challenging.

• They should be marking on understanding and valid opinion as well.

• Exams are a representation of the work you do. In the work place, you have to have a much broader knowledge.

• Showing initiative is good practice for job situations.

Question 5 differed from the other questions already discussed because it was the only question where Perry 'C' thinking did not dominate. This, as already discussed at the beginning of the treatment of this question, obviously had some thing to do with the fact that it talked about examination issues.

Question 6

It has already been stated that the Level 1 students answered the question that was in the original questionnaire while the other levels answered the question in the modified version. In Appendix 7f, the Level 1 results are written first, and the results of the other groups follow immediately after. In Table 6.5, the Level 1 results are written in bold to help remind the reader of this issue.

The Level 1 results will therefore be discussed first. This discussion will not go into too much detail, as Level 1 cannot be compared with the other levels. The research was mainly aimed at finding out how the perceptions change through the years, therefore the Level 1 results for this question do not have too much bearing on the research.

Level 1 Results for Question 6

Original question (Level 1): I am very confident I can pass this course.

Grounds for changing the question

Question 6 was intended to find out how confident the students were. This was supposed to give a feel of how much the students believed in themselves. It was expected that intellectually mature students would be more confident in themselves, while the less advanced students would be more confident in the system but less so in themselves as holders of legitimate knowledge. The intention was to find out how confident one could be in operating in a scientific community, for instance. Belief in oneself as a holder of relatively authentic knowledge, readiness to give and face constructive criticism, good communication skills and attitude, could all be good measures for this.

The Level 1 results revealed that the original question did not adequately address this issue, but might have even measured a different context of confidence. Asking someone whether they are confident they can pass a course does not necessarily question their inner feelings about the extent of their knowledge. One could be very confident about passing just because they had observed that they had passed in the past without too much effort, as the following statement from Appendix 7f shows:

- I passed my last two modules well, and I'm doing well so far. If I keep up or work harder I should pass well.

This does not necessarily mean that this person could be confident in their knowledge of the material they give out in tests or exams. All they could be possibly confident about could be the fact that the system accepts such knowledge, and, as such the person could be sure to pass every time they gave the system what it calls for.

Another reason why the question had to be changed was that there were some statements given by students that could easily qualify as either Perry 'A' or 'C', depending on the context at which they were looked at. The classic example is that of equating 'working hard' to 'diligence that deserves rewarding'. A Perry 'A' student would regard spending a lot of time on memorising notes as diligence while a Perry 'C' students would regard diligence as doing more independent work and research. Both students would expect to be rewarded for their efforts. The following is a list of statements that fell under this category:

- Hard work produces good results.
- If I work hard enough I know that I could pass the course, but so far I haven't been working and it's reflecting in my results.
- Even if I take a course I don't like, I work hard enough to pass.
- I know that if I work hard I could pass. It's just a matter of will power.
- I am confident I will pass because I have been and will be working hard on the course.

• Even someone with no real talent for biology can pass with hard work.

It would be erroneous to categorise these statements as either Perry 'A' or 'C' as the question of what comprises hard work cannot be easily addressed by such statements. The last statement however, could be said to have a 'hint' of what the student could be meaning, though it is rather vague. It appears like this student feels one does not necessarily need to have good knowledge of biology to pass, but they only need to 'work hard'. While this statement does not explain what is meant by hard work, it carries the implication that not much knowledge is needed. The only way one could work hard to pass, and yet not need to know much about a subject is by employment of sheer memorisation. This however does not clearly qualify this statement as clear Perry 'A', because this is only but an assumption of its meaning.

There were some other statements that could easily be identified as Perry 'A' at first glance. If one thought more about them, however, they would find out that they could also possibly qualify as Perry 'C'. One example of such cases is where the issue of obedience seems to be the theme of the statement:

• I should be able to pass because I am doing everything that is asked of me.
• If I turn up and I study, I should pass quite easily. At the moment I am doing what I should.
• I complete all the work that is required.
• If I do the required work, I should be able to pass this course.
• If I do the homework, passing shouldn't be a problem.

Though they sound quite like Perry 'A' statements, it cannot be confidently concluded they are unless it is established what the 'required work' or 'homework' is. It is possible that the instructors might have announced the need for independent research, and in that case 'required work' could include this. The possibility that these could be Perry 'C' statements cannot be denied.

Some of the statements seemed to have a combination of the above issues of hard work and obedience. Examples are as follows:

• If I study hard, learn the facts, and complete the assignments on time there is no reason why I shouldn't pass.
• If I study hard and hand in work on time then I know I can pass, but I'm not sure by how much.

- I am confident, as I will try my best to do all the work and hand it on time.
- I have done all the work to date, and intend to continue studying for the exams.
- I can meet all the deadlines and gain sufficient knowledge to pass the exams.
- I have worked quite hard, met all deadlines and understand the course.

It is possible that the 'meeting of the deadlines' might be being done to show good studentship and obedience. This however does not clarify what type of 'hard work' is actually being done.

Still under this Perry 'A/C' category, there were statements that implied that the students might not have been presented with the challenges necessary for promoting growth:

- Nothing seems to be conceptually difficult, and a fair field of work has been covered already.
- I need to do a bit more study, but work in 1st Year isn't actually difficult.
- I will pass because it's all Multiple-Choice questions.

As already discussed before, this if true, could only be 'good' for the students in the short term, as this would make them pass exams, but in the future, they are bound to meet much more challenging situations that they might not be able to deal with.

It was observed that a lot of students gave statements that fitted this Perry 'A or C' category, registering a good 37.22% (see Table 6.5).

General overview of the results

Even though the question did not measure what it was intended to measure, a brief look at the distribution of what could be classified as Perry 'A', 'B' and 'C' statements was worth taking. Table 6.6 shows that the usual trend of the dominance of Perry 'C' thinking (40.92%), followed by Perry 'B' (16.99%) and least Perry 'A' (4.87%), was observed. This however could not be taken to be a true representation of the results since the Perry 'A or C' category could easily upset this, if the issues discussed above could be clarified.

The important thing is that the question managed to expose some issues that need attention, especially the issue of lack of challenges. The percentage of students who voiced lack of challenges might be low, and instead of being a consolation, this is worrying in that it is possible that most of the students are happy to go on without being challenged. However low the proportion of the unhappy students are, the statements below need to be taken seriously:

- The course seems to be assessed on what we are taught and requires simple ability to recall facts, as opposed to forming them into essays and reports and the likes of such.
- I have to work on Multiple-Choice questions. (Since I'm not used to them, I could have spent more time testing myself on them instead of also trying to improve my essay writing – I failed!!!)
- My progress so far has shown that I am coping with the course, although I do believe I am underachieving.
- At the moment I am not working at the best of my ability, but I am still passing, so I can still do better.

Students also need to be properly informed of the requirements of the courses, so that they can make the right choices. This would avoid the frustration that was voiced by one of the students who wrote:

- I do not know if I will pass or not. I feel that although it is stated, no previous knowledge in the subject is a severe disadvantage, considering the pace and amount of material taught.

Proper communication with the students would also ensure that the students know that they are expected to do independent work, and situations like the one below can be avoided:

- I am not confident in the lecturers. I don't feel we are informed enough in what we need to know. Some lecturers are very poor, so it is hard to take notes.

While this statement could possibly mean that the student felt they were not given as much information as they wanted, the fact that they made reference to 'not being informed enough in what they need to know' makes it a matter worth considering seriously by the instructors.

Question 6 for the other Levels

Final questions (Other levels): I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.

Possible cases of misinterpretation of Question 6

Though it might have appeared that the question was fairly straightforward to most of the students, considering that there were no obvious cases of misinterpretation, there were students who wrote statements that were difficult to categorise. Fortunately only two students from the whole of the four groups did this. The statements were:

- I too can memorise things.
- I am very bossy and everyone else in my family is too, so I learnt to shout at an early age.

One can only speculate as to why these statements were given. It is possible that in the first case, the students might have thought that they did not need to offer their opinions and views, but just to memorise what they were given. Even though it was not included in the computation of the Perry 'A' proportion, it was given a partial Perry 'A' identity in Appendix 7f, for this reason. The statement did not provide enough information to give it a full Perry 'A' identity in the context of the question.

The second statement did not have much relevance to the question either. Though lack of inhibition could be taken to be a possible indicator of confidence sometimes, if it escalates to an extent where one becomes bossy, then it does not qualify as confidence anymore. A bossy individual would not communicate well with others, and is most selfish and uncompromising. As such, they cannot possibly qualify as a Perry 'C' type of individual. This character does not even place them in the 'innocent' and trusting stage that is usually characteristic of Perry 'A' thinkers. It was also definitely a character that can be found in the always 'unsure and uncertain' Perry 'B' thinkers. As a result, it was difficult to categorise this statement.

Perry 'A' statements in Question 6

This question produced relatively large proportions of Perry 'A' statements compared to others. This did not come as a surprise because in some cases, human beings are modest, and would not admit confidence in themselves. This might have a lot to do with the fact that people do not want to appear to 'know too much'. Some people however might even believe that expressing oneself is typical behaviour of a *poseur*, and would never do it, as this statement reveals:

- If I was that smart I wouldn't be a 33-year-old 2nd Year student. I am here to learn, not to listen to my own voice.

In some cases however, people genuinely lack confidence in themselves, for reasons that are not easy to explain. Some researchers have concluded that no matter what kind of reasons might be given for not wanting to participate in public speaking, it all boils down to fear. Ashley Simmons (www.cybernetik.com.au/chp2excpt.html) suggests that fear related to public speaking can be analysed and overcome. She suggests that people might just be afraid of making fools of themselves; that they might dry up during the speech; that they might not be able to speak for all the time allocated; that they might leave out something they wanted to say; or just feel that it's not in their nature to speak in public. Janet Esposito (www.performanceanxiety.com/about.htm) gives a much more detailed analysis of this in here writings about stage fright and performance anxiety:

> ... Because many adults have and intense fear and anxiety about public speaking, they often try to avoid situations in which they will be called upon to speak in public...While a mild level of anxiety is perfectly normal when one is called upon to speak or perform in public, many people suffer from a much higher level of fear and dread...This fear also takes a big toll on the person's self-confidence and self-esteem, as many people feel embarrassed and ashamed to have such a fear. They may look at others who seem comfortable speaking or performing in public and feel bad about the level of fear and discomfort they have, relative to what they perceive others experience. A very deep fear associated with public speaking is the fear of humiliation and negative evaluation by others. Many people feel terrified of making a fool of themselves in front of others, and for people to judge them as inadequate in some way. People with this fear also suffer from a great deal of self-consciousness and embarrassment being the centre of attention when speaking or performing in front of others... (page 1)

Most of the Perry 'A' statements seem to have been captured by the above quotation.
The different Perry 'A' statements from Appendix 7f are discussed below. All of them echo what was said by Janet Esposito. The first selection of statements seems to sound like this situation is brought about by a character one is born with:

- I am not confident.
- I'm too self-conscious.
- I am not particularly confident, and would be uncomfortable doing so, so I generally prefer to keep quiet.
- It is not in my character to speak out.
- It is my character not to express myself, I prefer to keep my opinions to myself.
- I am a shy guy.
- I have such little confidence I can't bring myself to justify this decision.
- I don't because speaking in public is a bit of a daunting task!
- I am a severe introvert and have self-confidence problems.

The last statement just about sums the issue up. These students do sound as if they are naturally inhibited, and need a lot of encouragement to come out of their shells. In some of the students however, lack of confidence might have been a direct product of the environment in which they live, as the following statement indicates:

• I am an introvert. My parents keep me locked up in the cellar when I'm not at university, but I love my mother.

To what extent that statement is true can only be anyone's guess. However, it serves to demonstrate how our environment shapes us. This issue will be discussed again when dealing with the Perry 'B' statements. It is not only home environment that can result in lack of confidence, classroom environment also matters:

• It's sometimes too intimidating an atmosphere to speak out. It dents the confidence to answer or express an unpopular opinion.

The above statement shows that some students might have seen the classroom environment as intimidating because they themselves were afraid of losing face in front of other students. These students might have felt so because of simple lack of belief that they could know anything correct:

• Sometimes my I think my ideas will be wrong.
• I am not always confident about my opinion, worry about being wrong.
• I would be embarrassed if I was wrong.
• My opinions always have faults, so I don't bother airing them.
• I'm usually nervous, plus my ideas may be wrong.
• I feel I as if I do not know enough to express opinions.

These statements are representative of typical Perry 'A' thinking, and agree with the quotation above, from Janet Esposito. What the students need to be made aware of is that they would probably learn better by making these mistakes, as they would tend to remember the encounter. Keeping quiet on the other hand would result in their keeping those views with errors for a long time, if they do not brainstorm with others.

In some cases, the students expressed behaviour that Perry suggested is common in Perry 'A' students. Since they do not believe in their own knowledge, they tend to always want to make sure they had either lots of or 'correct' type of knowledge, possibly as indicated by lecturers, before saying anything in class. :

- I won't express myself till I'm sure what I'm saying is absolutely correct.
- I express myself only if I am pretty sure I am correct, or that it might direct my thinking to a correct answer.
- I speak out only when I am sure of my facts, if not, then I will not speak out.
- I only express myself if I know the subject well enough, and feel I know what I'm talking about.
- I don't want to look 'daft' in front of others.

What these students fail to realise is that one does not need to have a lot of knowledge to voice an opinion. In most cases actually, one's opinion is born out of listening to, and then thinking about other people's deliberations. Students should be made aware that they are not alone in having fear of speaking in public. They should be made aware that they need to face their anxiety lest it grows into a serious case of fear.

Whatever the reason might be that the students might have for not wanting to take part in class discussions, they need to be informed that learning requires this interaction. They also need to know that, at one point in their lives, they are going to have to face the public to speak out, so the sooner they learn these skills the better. Janet Esposito (www.performanceanxiety.com/about.htm), states that this fear strongly affects an individual's professional life and possibility for career advancement, with some people even quitting school or a job, or passing up on advancement if it calls for more public speaking or public performance. Students therefore, need to be made aware of the dangers of postponing dealing with their fears as it could only end up being detrimental to their own futures.

Janet Esposito further states that while a person can often successfully avoid speaking in public, the avoidance behaviour actually worsens the fearful response as the individual does not learn more effective coping strategies to help him or her overcome the fear. She concludes that while the avoidance initially provides a feeling of great relief, it takes a big toll on the person's confidence and self-esteem and greatly limits and constricts the person's life choices.

Transition from Perry 'A' to 'B' in Question 6

There were some statements that suggested that the students were aware of the fact that they needed to be more confident in themselves. These included the following examples:

- I prefer to fade in the background. Terrible, I know, but that's just me.
- I am not very confident, and this causes problems.
- I should be more confident.
- Personally I don't because I always think I am wrong, but I should be more willing to speak out because it's a pessimistic view.

Such statements were identified as Perry 'A/B' to show that the students were capable of moving away from the Perry 'A' position, but were possibly not sure of how to achieve that. All that these students need is proper motivation, challenge and encouragement to help them take the courage to deal with their inhibitions. Some of the Perry 'A/B' statements showed that though the students might have indicated their lack of confidence, sometimes they would contribute something in class. Examples of such statements are:

- I ask questions if I'm stuck on something, but that's it.
- I like to participate in discussions, etc. but only when I feel comfortable in the group.
- If I know what I'm talking about then I will, but since starting university my confidence has gone down the proverbial 'pan'.

In such cases, there is hope that the students can be encouraged to participate more given the optimum conditions.

Perry 'B' statements in Question 6

It was evident from some of the Perry 'B' statements that some of the students had actually begun to have more trust in their peers' opinions. The students giving such statements were however, still uncomfortable with participating, themselves:

- I do not express myself but absorb more what others say and think about this, and mull over my own opinions.
- I am not confident in myself and although I have my opinions and views I prefer to hear others' before expressing myself.

• I am very happy to hear others' opinions and views but I'm not confident in expressing my own.

In such cases, what needs to be done would be to try and make students feel that if they can trust in others, they should be able to trust themselves.

There were some statements that were categorised as Perry 'B' because the students gave Perry 'A' statements together with either Perry 'B/C' or Perry 'C' ones. This was a case of striking a balance between the statements. Examples of such cases are:

• To an extent I am confident in speaking ('B/C'), but sometimes feel intimidated if I don't know much on the subject ('A').
• I am only confident when I know what I'm talking about ('A'). If you speak you can learn from your mistakes ('C').
• It can be intimidating to talk, especially if you think you may be wrong ('A') – but I believe you learn best from other people ('C').

These statements offer a lot of comfort in knowing that the students know about the benefits of expressing their views and listening to others. With that knowledge, it wouldn't be difficult to help them deal with their insecurities. There were some students however, who, as already discussed before, might have felt disillusioned by the negative responses they got from their classes. The statements below show that this might have come not only from other students, but from instructors as well:

• There is no point in expressing opinions because it is not appreciated.
• I know that a lot of people in lectures, discussions, labs etc. are not interested in my opinions so I keep them to myself.
• Not everyone is supportive of a person who likes to express his or her views, fear of being mocked.
• The tutors can be patronising it's hard to speak.
• Too often own opinions are poo-hoed by members of staff. Once I was told I was wrong and made a fool and a freak in front of the class. On being proved right no attempt was made to reassure my fractured ego and I was left feeling disillusioned in the whole zoology subject.
• Some members of staff are condescending when the wrong answer is given. I fear if this is the state of modern higher education, there needs to be a major revision of teaching standards.

It is one thing for students to 'boo' each other, but once this is done by members of staff, it can be very discouraging to students. In the worst scenario, the students might even end up intimidated for the rest of their lives. Members of staff are supposed to be there to see to the proper intellectual, moral and ethical development of the students. For them to achieve this, they have to lead by example, and even act *in loco parentis*, taking a parental standpoint. They should be aware of the dangers of ridiculing students. Students should be given more opportunity to express themselves and be respected for doing it, if they are to grow into respectful adults themselves. 'Shooting their ideas down in flames', as one student put it, would not teach them the skills of proper communication with others.

According to Table 6.5, the proportions of Perry 'B' statements were higher than those for Perry 'A' statements only in cases of early and late Level 2. The latter, as expected, recorded the highest proportion. With these values exceeding 25% for all the groups, one would feel that this deserves attention. A look at Appendix 7f would reveal that these values were probably made higher by the dominance of Perry 'B' in Perry 'A/B' and even more so in Perry 'B/C' statements. In the latter case, most of the students expressed fear of facing large groups, preferring smaller groups. As a result, lecture forums were found to be more intimidating than labs, discussions or tutorials:

- I only express my opinions during labs and discussions, and not in large groups because I have limited self-confidence.
- In lectures and large groups it can be difficult to speak out, but labs/PBLs/tutorials it is easier and can be helpful.
- I find it difficult to put my opinions towards big groups but not in smaller groups where there is more chance to speak out.

The results indicated that this was a serious problem. It appears as if these students need to be trained more in the art of addressing large groups. Communication skills need be taught at very early stages, perhaps at the beginning of the courses. Though teaching students how to speak in public might not be the number one priority for a biology lecturer with a busy schedule, it would surely benefit the students a lot if individual lecturers could try and make this possible once in a while. This does not necessarily mean offering full-time courses on speech making, but offering opportunities for students to be involved in talking to others. Class seminars or peer-teaching opportunities could help achieve this, if incorporated in the normal teaching schedules. A few tips on how to deliver information to others would go a long way in building student confidence. After all, this is a characteristic of High Quality Learning, according to Nightingale and O'Neil (1994).

Some students indicated that they felt especially uncomfortable where they did not know members of their groups. Such interactions as group work followed by presentations and seminars would not only help them in practising the skills of team-work, but also in getting to know each other more. The following cases could be easily got rid of:

- If I know people I can talk easily, but not if I don't know them.
- I find it difficult in environments where I don't know people around me, but I do it in front of my friends.

Other students seemed to have the feeling that participating during lecture time was either a waste of time or sheer rudeness:

- I like discussing opinions with fellow students instead of wasting lecture time.
- I don't express myself in lectures because that is rude. But sometimes you miss something that someone else hasn't, and by discussing it you get everything right or close to it.
- I express myself but I don't interrupt the lecturer.
- I would ask questions at the end of lectures, but wouldn't shout in the middle of lectures.

It would be most helpful to these students if lectures were made more interactive, and the students dissuaded from being passive in class. So far it has become apparent that a lot of students needed encouragement from lecturers and other members of staff.

Perry 'C' statements in Question 6

A lot of students expressed interest in wanting to be heard, and to hear others' views. Sharing views seemed to be appreciated for giving the students alternative ways of looking at things; promoting further thought about issues; increasing understanding and effectiveness of learning; widening students' knowledge scope; providing opportunity for self-evaluation through comparison with others and providing a useful check on whether one is on the right track or not. Examples of Perry 'C' statements follow:

- It is important to express your thoughts and hear others' as well.
- Discussions make the topic more interesting, different views are heard.
- Discussions encourage you to think on the spot about subject, I find this very useful.
- If you don't participate and ask questions you can't learn effectively.
- I express myself because I need to know if I'm on the right path or if I'm totally wrong.
- I like to discuss things as it helps me understand if I talk problems through with others.

The fact that some of the students found discussing problems with peers a worthwhile exercise was quite encouraging. Ashley Simmons (www.cybernetik.com.au/nerves.html) wrote:

> … Shakespeare said: " All difficulties are easy when they are known."…(pg. 1)

All this gets to show that there is a lot that can be achieved from speaking out and interacting with others. It was also interesting to find out that some students enjoyed keeping themselves abreast of scientific developments and felt that they had the right to question some of the scientific practices:

- I enjoy discussing new and interesting science developments.
- It is important to question the ethics of science.

Some students even went as far as offering ideas as to what they would like to see happen in their own education:

- I think more should be done to make the course more interactive.
- I would like more PBLs.
- I don't get embarrassed or too nervous. I think it's necessary for practice talks, seminars, etc, to be included in courses.
- Self-confidence is vital, and also a skill that needs to be developed.

Members of staff should pay attention to such comments and listen to the needs of students in order to help them develop.

6.3.2 The 'Sophomore Slump' at late Level 2

It has been proven so far that the late Level 2 group did have problems compared to the other groups. The fact that the above results indicate that the Level 3 perceptions were not too far way from the late Level 2 group's indicates that Level 3 might have been just recovering from the effect of what happened to them at late Level 2. The late Level 2 results seemed conclusively to corroborate the finding that this level was actually at a very disillusioning phase in their university education. The cause of this effect could only be assumed to be what causes the infamous 'sophomore slump' observed in colleges in the United States of America, and probably many other countries. An analysis of the University of Botswana results should help find out if this occurred there too. One can only speculate about the causes of 'slumping', but an excerpt from the internet written by Michael Murphy in October 1997 (www.oakland.edu/~mtmurphy/column108.html), probably about his own college experience, might help shed a light on this:

Sophomore Slumping

October 8, 1997

It wasn't going to happen to you. The Sophomore Slump? The famed grade-sagging malady affecting second-year college students? Only for the weak-minded. But it's late October, one-third of the semester is down and that frown on your face tells me something. Does this sound familiar?

Pre-Week One:
You're excited - it's year two! You finished strong at the end of your freshman year, worked over the summer in a greasy job and now it's time to learn again. You have four classes and a lab - 17 credits. No problem. Sure, it sounds like more than last year, but how bad could it be? You buy your books in Mid-August, and pick up some of the recommended books - just in case.

Week One/Two:
Wow! Classes look tough, huh? But that's only syllabus shock, right? You get to class 20 minutes early.

Week Three:
You're a little upset. Your free time is decreasing. The syllabus shock isn't receding. Could this be for real? You show up to your classes 10 minutes early now, and you leave class tired. You're starting to skim the "useless" parts of reading. You have a vague uneasy feeling.

Week Four:
You're upset. You have no free time. You've lost the syllabus for one class, but that's fine - you'll just read at your own pace. You're starting to skim the reading for two of your classes, because you've decided they're basically useless. You're getting to class on time - usually. The uneasy feeling is growing. Is it going to be like this all semester?

Week Five:
Yes, it is. You're getting really upset. You've lost the syllabus for two classes, and since you don't know what to read you haven't done the reading. You're skimming the rest of your reading, because right about now, all college classes seem useless. You really have no free time. You're late to class, and when you do show up, you fall asleep. The uneasy feeling is growing quickly and strong.

Week Six:
You're in trouble. It's almost time for the first round of tests, and you're not ready. You've lost your math book, but you weren't reading it anyway. You don't remember the notion of free time. You find yourself growing severely tired just walking towards class. The uneasy feeling reaches a peak as you "take" the first of many tests.

Week Seven:
You get your tests back. You're really in trouble. You dramatically failed one of your useless classes, and you've now lost the syllabus, the book and the drop slip for your other class. Someone asks you to do something "in your spare time" and

that's _really_ funny. One of your parents asks you, "How's school going?" You scream and lock yourself in the bathroom. You find yourself growing sleepy on the way to class, which is particularly dangerous if you commute.

Week Eight:
You spend most of week eight in bed, trying to convince yourself that this isn't happening.

Week Nine:
This is happening. You're not upset, though. You've dropped your useless class - 17 credits is way too much. You have a little spare time now, most of which you spend sleeping. You haven't been to class on time since week three, but you figure that your professors should count at least some your disruptive tardiness as an artistic form of class participation. You find the syllabus and book for the class you dropped, and gleefully set them on fire.

With a bitter smile on your lips and a pained expression on your face, you look in the mirror and realize that your Freshman year is officially over, and you're mired in the Sophomore Slump.

Welcome to college.

Michael Murphy
"You can lead a boy to college but you can't make him think."
-Elbert Hubbard

Reading between the lines of the above excerpt can provide useful clues as to what might have been happening. What is referred to as a 'syllabus shock' might be increased loads of work and increased complexity of material in the syllabus. This could be explained by feelings of 'decreasing free time'. As time goes on, the student realises that there are some aspects that are not the main issues in the course. This ability to determine this on their own could be indicative of their perception of multiplicity in certain aspects of their courses. The 'vague uneasy feeling' could be said to be equivalent to uncertainty in this multiplicity, which grows as the weeks go by.

Throwing away the rest of the syllabus and not knowing what to read as a result might be taken to be manifestations of a Perry 'B' feeling. The student's attempt at selecting relevant material has failed, so he gives in just goes with the flow. 'Skimming the rest of the syllabus' is significant of giving up. As time progresses, this uneasy feeling affects the student, not only mentally but physically as well. The final straw comes in the form of 'tests', which the students obviously fails. This inevitably leads to surrendering, which the student does by avoiding contact with those who might want to know about his 'progress'. By the end of the year, all that is left is a numb feeling of hopelessness that is expressed by 'a bitter smile and a pained expression on their face'.

Though Michael Murphy defines the sophomore slump as a 'grade-sagging malady affecting second-year college students', the truth of the matter is, it goes beyond that and affects the students mentally and physically as well. The fact that this research managed to detect it without looking at students' grades but just their attitudes is perfect proof for this. It is also further proof that this questionnaire is a valid measure of what is happening to the students at different levels of their study.

Identifying the main cause of the slump is the main thing to do, if one was to try and find ways of dealing with it. From the excerpt above, this comes across as 'syllabus shock'. It is important for lecturers to find out what it is about Second Year syllabuses that shocks students. As already proposed before, this could probably have something to do with workloads or the type of material the students are asked to face. Michael Murphy did mention that 'classes look tough!'. This could possibly mean that there might have been a huge discrepancy between Level 1 and Level 2 content. This could be true as even in this research, it was uncovered that Level 1 students felt unchallenged by Multiple-choice, and being given all that they needed by lecturers. Presenting the challenges at Level 2 could only shock them. What instructors need to do is make sure that students are introduced, in a gradual and subtle manner, to the multiplicity that is characteristic of university and college syllabuses.

That the 'slump' shows up at late Level 2 is not a wonder since Michael Murphy's writing shows that the giving up happens towards the end of the year.

The Null-Hypothesis that there would be no differences in the perceptions of the students at different levels of undergraduate biology courses can therefore be rejected on the basis of the results above. The question of whether progress increases with increasing university levels can be answered in the negative, since the growth was not observed to be linear. The most important finding was that the students manage to recover from the pitfalls and advance to levels higher than those they were at when they first entered university.

6.3.3 Chi-square analysis of Glasgow University Part 2 results

The results above have shown that there were differences between the perceptions of students at different levels of undergraduate biology study. What these results did not show was how significant the differences were. As in Part 1, a chi-square treatment of the results was conducted to find this out. Table 6.6 below shows the results of this operation. The distributions of the students among the three Perry categories are being compared. Each group's distribution is compared with each one of the other groups'. The calculations were done using the raw frequencies.

Instances where the differences were significant are indicated in **bold-type**. The chi-square values were gauged against the critical values below the table, which are from Lewis (1967). The extent of the difference between any two levels was judged by the number if 'bold boxes'. The asterisks near some chi-values indicate the number of cells in the computation of chi-square where the expected frequencies were less than 5%. This would therefore mean that the chi-square value could possibly be in accurate.

The results seem to indicate that the differences were mostly significant between late Level 2 and Level 4. This made sense since it was observed that Level 4 was the most advanced while late Level 2 was the least so. The fact that in Question 3 there were 2 cells with expected frequencies less than 5% did not affect the results, as even if this question was dropped off, there were still more significant differences between these two levels than in any other comparison. The results could therefore be taken to indicate that, in terms of advancement: Level 4 > Late Level 2.

Table 6.6: Chi-square results for the comparison of the different Glasgow University Levels

	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
L1 vs. L2e	**11.895** ***df=2*** ***(0.01)***	2.942 *df=2*	**4.677** ***df=1*** ***(0.05)***	**19.775** ***df=2*** ***(0.01)***	3.604 *df=2*	N/A
L1 vs. L2l	**8.840** ***df=2*** ***(0.05)***	4.140 *df=2*	0.147 *df=1*	**23.510** ***df=1*** ***(0.01)***	4.794 *df=2*	N/A
L1 vs. L3	**26.184** ***df=2*** ***(0.01)***	0.025 df=1	0.194* df=1	1.231 df=1	1.605 df=1	N/A
L1 vs. L4	**11.187** ***df=2*** ***(0.01)***	1.562 *df=2*	**5.517** ***df=1*** ***(0.05)***	0.029 *df=1*	**9.081** ***df=2*** ***(0.05)***	N/A
L2e vs. L2l	2.865 *df=2*	0.205 *df=1*	2.929* *df=1*	**8.310** ***df=1*** ***(0.01)***	1.144 *df=2*	4.803 *df=2*
L2e vs. L3	**9.795** ***df=2*** ***(0.01)***	0.094 *df=1*	0.460* *df=1*	0.008 *df=1*	0.119 *df=1*	4.495 *df=2*
L2e vs. L4	5.585 *df=2*	0.852 *df=1*	2.044* *df=1*	1.846 *df=1*	**14.190** ***df=2*** ***(0.01)***	2.783 *df=2*
L2l vs. L3	3.008 *df=2*	0.005 *df=1*	0.362* *df=1*	**4.419** ***df=1*** ***(0.05)***	0.229 *df=1*	5.669 *df=2*
L2l vs. L4	**10.376** ***df=2*** ***(0.01)***	1.235 *df=1*	**5.666**** ***df=1*** ***(0.05)***	**10.919** ***df=1*** ***(0.01)***	**14.583** ***df=2*** ***(0.01)***	**7.042** ***df=2*** ***(0.05)***
L3 vs. L4	**12.753** ***df=1*** ***(0.01)***	0.902 *df=1*	3.097** *df=1*	0.910 *df=1*	**8.972** ***df=1*** ***(0.01)***	0.629 *df=2*

Critical Values

	0.05	**0.01**
• **Degrees of freedom (df) = 1**	3.84	6.64
• **Degrees of freedom (df) = 2**	5.99	9.21

(Values from Lewis (1967))

Level 4 was also found to be quite significantly different from Level 1 (Qs 1, 3 & 5). In all these, Level 4 had higher proportions of Perry 'C' statements. Since there were fewer instances where Level 4 and Level 1 were significantly different than in the case of late Level 2, it could be assumed that Level 1 was slightly more advanced than late Level 2. The rank order then becomes: Level 4 > Level 1> Late Level 2.

When Level 1 was compared with early Level 2, there three questions where the differences were significant (Qs 1, 3 & 4). Level 1 had a higher Perry 'C' proportion in only one of these (Q1), while early Level 2 was more dominant in the other 2. This placed early Level 2 above Level 1. The result then becomes: Level 4> early Level 2 > Level 1 > late Level 2.

To try and find a place for Level 3 in the above rank, it has to be compared to Level 1, early Level 2 and late Level 2. There was one question only where late Level 2 was significantly different from level 3. In this case, Level 3 had a higher Perry 'C' proportion, placing it above late Level 2. On comparing Level 3 with early Level 2, there was also one question where the difference was significant. This was in Question 1, and in this question early Level 2 had a higher Perry 'C' proportion, thus placing it above Level 3. So it was found that Level 3 was above late Level 2, but below early Level 2. To find out exactly where, Level 3 was compared with Level 1. The only significant difference was observed in Question1, where Level 1 had a higher Perry 'C' proportion. It was therefore suggested that differences were significant in the following order of decreasing level of intellectual maturity:

Level 4 > early Level 2 > Level 1 > Level 3 > late Level 2

Compared with the rank-order obtained in Part 1 (L3 > L4 > L2e > L1 > L2l), this rank-order seems to make more sense because if students have problems at late Level 2, they are bound to be just recovering at Level 3. The mismatch between the results from Part 1 and Part 2 for Level 3 therefore seem to suggest that these students might have just provided views that they thought were expected of them in Part 1.

The position of late Level 2 in the order of development is however supported by results from both Parts of the questionnaire. This therefore means the staff need to revise their ways of instruction and assessment at Level 2 if intellectual growth in students is to be achieved.

CHAPTER 7

COMPARISON OF THE PERCEPTIONS OF GLASGOW UNIVERSITY STUDENTS WITH THOSE OF THE UNIVERSITY OF BOTSWANA STUDENTS AND GLASGOW UNIVERSITY STAFF

7.1 Introduction

This chapter will be focused on finding out how the University of Glasgow (GU) students' perceptions compare with those of their staff and those of the University of Botswana (UB) students. The aim is to make a parallel comparison between the general trends of both sets of results. It can then be seen whether the students in the two universities went through similar lines of development. It would be interesting to find out how the distributions of the Perry categories compare, and if the students might have experienced similar kinds of obstacles in their developments. The nature of the obstacles may not be easy to identify, but at least it can uncover the levels at which such obstacles might have been met. If the distributions prove to be somewhat similar, it could be concluded that Perry's scheme of intellectual development could probably be applicable to different universities, irrespective of their country of origin.

The discussion of the results in this chapter will not go into as much detail as that in Chapter 6, but where certain peculiarities are observed, an attempt will be made to discuss them. This chapter will be divided into two sections. Section 7.1 will focus on the results from Part 1 of the questionnaire while Section 7.2 will focus on the results from Part 2 of the questionnaire.

7.2 Comparison of the Results from Part 1 of the Questionnaire

As it is already known, the questions in this part of the questionnaire were based on the different aspects of students' learning, and as such, it is important to look at these questions individually before giving a general discussion of the results. This section will therefore be divided into three sections: Section 7.2.1 will be an Item-by-Item analysis of the results, Section 7.2.2 a general discussion of the results, while Section 7.2.3 will deal with a chi-square comparison of the two universities.

7.2.1 An Item-by-item analysis of Part 1 results

The questions will be dealt with systematically from Question 1 to Question 11. The relevant Tables and line graphs are given side-by-side to make the comparison easier. The line graphs have been reduced in size for this purpose.

There are some points of notation that need to be clarified here. What is referred to as a Level in the University of Glasgow is equivalent to a Year in the University of Botswana, i.e. both Level 1 and Year 1 mean that the students are in the 1st Year of their course. The two universities will be referred to as GU and UB during the rest of the discussion. Another important thing to consider is that the two universities start and end their academic years at the same times. Since the results in this research have been seen to be related to when in the year they were collected, it is important to recapitulate the data collection dates below:

Table 7.0: Summary of Dates of data Collection

	High School	1st Year	Early 2nd Year	Late 2nd Year	3rd Year	4th Year	Staff
GU		March '98 (Late L1)	Nov. '98 (Early L2)	Apr. '99 (Late L2)	Oct. '99 (Early L3)	Dec. '99 (Early L4)	Nov. 99
UB		Nov. '99 (Early Yr1)	Nov. '99 (Early Yr2)		Nov. '99 (Early Yr3)	Nov. '99 (Early Yr4)	

The periods in brackets just serve as a reminder of how far in the level or year of study the students were. GU Level 1 students would have had more university experience than their UB Level 1 counterparts. The same advantage would have been enjoyed by the GU late Level 2 group, as compared to the UB Year 2 group. These differences will be taken into consideration when comparisons are made.

Question 1

Statements: In order to pass my course, I need to study just what the lecturer indicates or tells me. / I do not have to rely totally on the lecturer. Part of my learning is to work things out myself.

Tables 7.1a (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q1

Table 7.1a(I): GU – Part 1 Q1

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	1.48	1.02	5.56	5.26	0.00	1.67
2 'A'	6.94	11.73	12.96	10.53	5.56	5.00
3 'B'	10.66	10.20	11.11	2.63	9.26	1.67
4 'C'	49.93	46.43	51.85	50.00	42.59	20.00
5 'C'	29.10	30.10	18.52	31.58	42.59	71.67

Table 7.1a(ii): UB – Part Q1

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	1.46	1.32	1.41	4.17
2 'A'	3.41	6.62	15.49	2.08
3 'B'	11.22	10.60	19.72	2.08
4 'C'	24.88	21.85	30.99	25.00
5 'C'	59.02	58.94	32.39	66.70

Figures 7.1a (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 1

Figure 7.1a(i):GU – Part 1 Q1

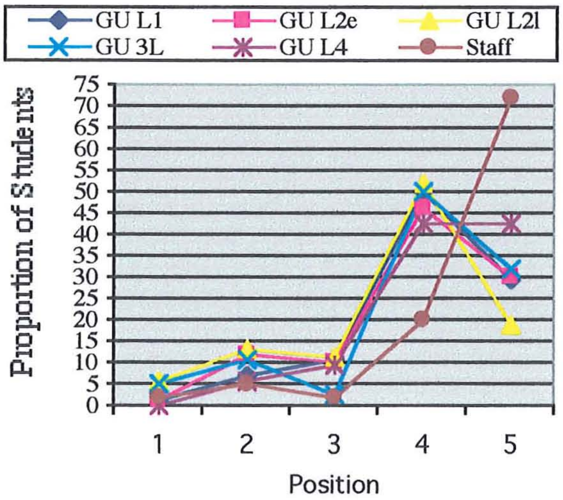
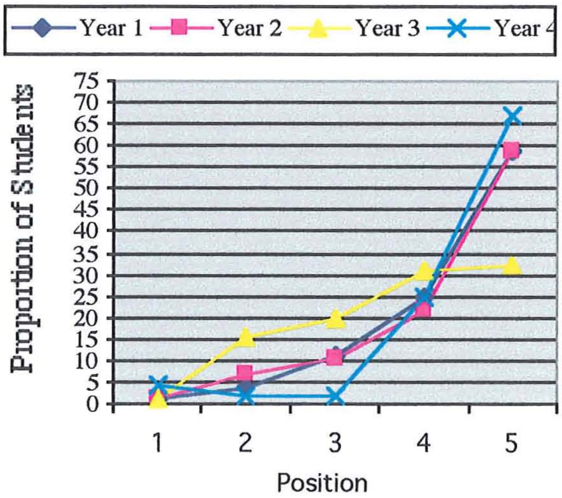


Figure 7.1a(ii): UB – Part 1 Q1



Comparison of university distributions for Question 1

Tables 7.1 a(i) and (ii), and Figures 7.1a(i) and (ii) above show that there was a prevalence of Perry 'C' thinking at all levels in the two universities. The distributions show that higher proportions of GU students went for position 4 than 5 of the Perry 'C' category (except for Level 4, who were equally distributed between the two), while the reverse was true for UB students. This could probably mean that the latter were more confident about working things out themselves than the former. The former might have felt a bit insecure about doing so, even though they knew that they had to be engaged in independent work.

In general, both universities produced low proportions of both Perry 'A' and "B' thinkers at all levels, in this question (all below 20%). However, it was observed that the UB Year 3 group did not only have higher Perry 'A' and 'B' proportions (though still below 20%), but it also had the lowest Perry 'C' proportions in both groups put together. Its values were almost comparable to those of the late Level 2 in GU. A look at the rank-orders of the three Perry categories in both universities would be worth taking. This will be done in the next section, where the general overview of the results will be discussed.

Comparison of GU staff results with student results

The GU Staff distribution was a little different from the GU student distributions. Much lower proportions of both Perry 'A' and 'B' categories were recorded, and the Perry 'C' category was dominated by position 5. This could be seen as a normal expected difference, as obviously, the staff should be at a higher level of development than their students. On the other hand, one could see this as an indication of the fact that the staff might have had much higher expectations of their students. This is not surprising, as there have been studies conducted before that showed that there is always that gap between the expectations of students and those of staff. The quotation below comes from Wilson (1981), who refers to one such study:

> ...Percy and Salter (1976) found that staff regarded higher education as providing students with the opportunity to acquire 'excellence'. By 'excellence' they meant the general ability to think critically and independently, and also the specialist competences of the subject. At the same time they acknowledged that few students would in fact achieve such excellence, and doubted whether it could be taught. ...(pg. 44-45)

It is necessary for members of staff to make sure that students understand what is expected of them, so that they can put in as much effort in their work as they possibly can. The fact that most of them did agree with the Perry 'C' end of the question, though not too strongly, indicates that they have the potential to grow further than that.

In any normal situation, it would not be problem if older people were found to have much more advanced perceptions of life than younger ones. In an educational setting however, especially at tertiary level, these differences could amount to differences in expectations of the staff and the students. Students could get more from their studies if they knew what was expected from them. A mismatch between the expectations of the staff and those of students could be seen as an element of lack of proper communication between the two groups. Students should not only be informed of the levels at which they are expected to function, but they should also be assessed in ways that can reflect these expectations.

Question 2

Statements: I cannot be wrong if I accept what the lecturer says. If I question anything, I might end up failing. **Vs.** I do not believe in just cramming what the lecturer says without question

Tables 7.1b (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q2

Table 7.1b (i): GU - Part 1 Q2

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	0.15	0.51	0.00	0.00	0.00	1.67
2 'A'	7.24	3.37	5.56	5.26	7.41	5.00
3 'B'	29.69	15.82	18.52	15.79	16.67	1.67
4 'C'	46.23	53.47	57.41	55.26	42.59	20.00
5 'C'	15.21	25.51	18.52	23.68	33.33	71.67

Table 7.1b(ii): UB – Part1 Q2

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	1.95	1.99	5.63	0.00
2 'A'	2.93	4.64	2.82	0.00
3 'B'	16.10	12.58	11.27	18.75
4 'C'	35.12	28.48	42.25	22.29
5 'C'	43.90	52.32	38.03	58.33

Figures 7.1b (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 2

Figure 7.1b(i): GU – Part 1 Q2

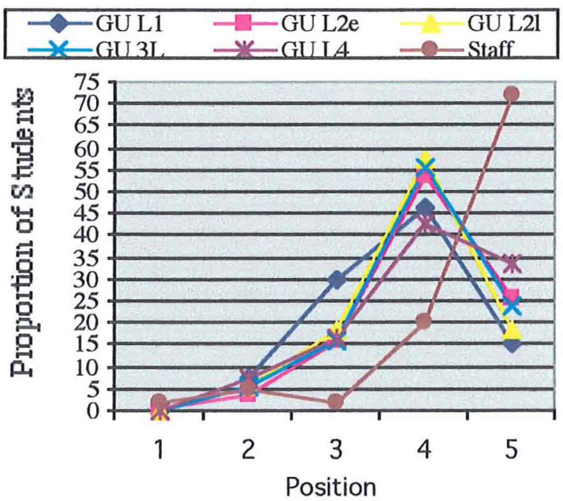
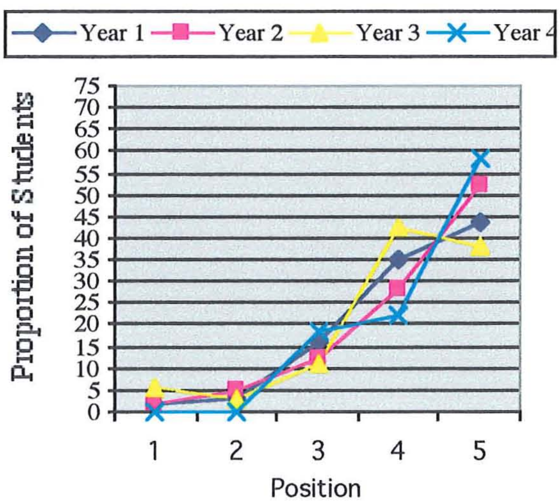


Figure 7.1b(ii): UB – Part 1 Q2



Comparison of university distributions for Question 2

Figures 7.1b (i and ii) show that the Q2 distributions took shapes almost similar to those in Q1. While the GU distributions were dominated by option 4 on the scale, the UB ones were dominated by option 5. The UB students seemed to have been more aware that lecturers are not infallible and that they should feel free to voice their disagreements where and when they occur.

The UB Year 3 group was the only one which had a distribution dominated by option 4 on the scale, once again giving an impression that they might have been less confident than the other groups where this issue was concerned. This makes one wonder if the 'sophomore slump' that seemed to be experienced at late Level 2 at GU might be experienced at 3rd Year at UB.

Comparison of GU staff results with student results

As in Q1, the staff distribution was clearly dominated by option 5. It is apparent that the Staff need to communicate more with students to make it clear what is expected of them. The results can be taken to imply that the staff took it for granted that the students should know about the fact that they had the right to question them, while the students might have felt uncomfortable doing so. Though the students' distributions are also skewed towards the Perry 'C' side, a lot of encouragement is obviously needed to bring them to the level expected by the staff.

Question 3

> **Statements**: I believe it is the job of the lecturer to supply me with all the knowledge I need. **Vs**. The duty of the lecturer is not to teach me everything, but to help me think for myself.

Tables 7.1c (i and ii) and Figures 7.1c(I and ii) show the distributions of the results for Q3.

Tables 7.1c (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q3

Table 7.1c(I): GU - Part 1 Q3

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	2.22	3.57	3.70	2.63	1.85	0.00
2 'A'	10.78	10.20	11.11	26.32	11.11	1.67
3 'B'	15.51	19.89	31.48	5.26	12.96	1.67
4 'C'	48.60	46.94	38.89	44.74	37.04	26.67
5 'C'	21.57	18.37	14.81	21.05	37.07	68.33

Table 7.1c(ii): UB - Part1 Q3

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	3.41	7.95	2.82	4.17
2 'A'	5.85	5.96	8.45	10.42
3 'B'	15.12	18.54	14.08	8.33
4 'C'	36.58	23.84	43.66	37.5
5 'C'	39.02	43.71	30.99	39.58

Figures 7.1c (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 3

Figure 7.1c(i): GU – Part 1 Q3

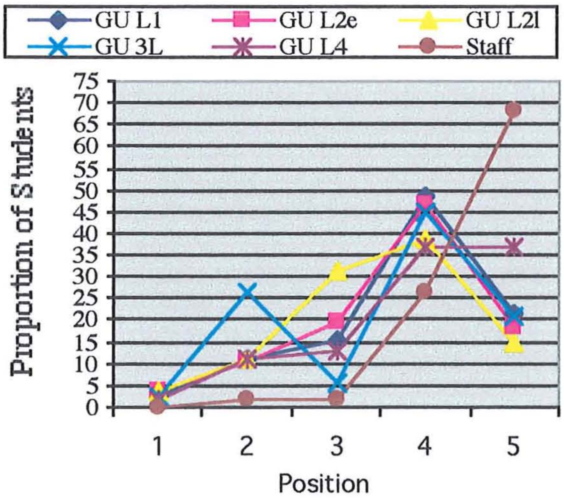
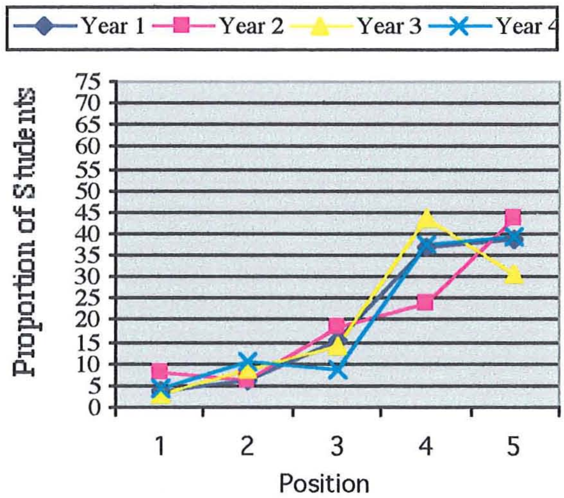


Figure 7.1c(ii): UB – Part 1 Q3



Comparison of the university distributions for Question 3

The GU distributions were once again dominated by option 4 of the Perry 'C' category. Unlike in the previous two questions (Q1 & Q2), option 5 of the Perry 'C' category was not too dominant over option 4 in the UB distributions. The results might have shown that the students had Perry 'C' perceptions, but the fact that the extent of agreement was generally not as strong as it was in the other 2 questions could not be ignored. This might imply that though the students agreed that lecturers were not supposed to supply them with all the knowledge they needed, they were not strongly in agreement with this. It can therefore be speculated that the students might have been indirectly indicating that they would rather have lecturers doing so, despite the fact that they knew it would not be the right thing to do. The problem with the UB Year 3 was observed here again, with a higher proportion going for option 4 while fewer students went for option 5. This, though noted, is however still not seen as too much of a problem as both options are within the Perry 'C' category.

Comparison of GU staff results with student results

The staff distribution was the same as in Q1 and Q2. Option 5 of the Perry 'C' category dominated, meaning that the staff felt more strongly about the issues than the students. The difference in this case might be taken to mean that the students did not know the extent to which they could rely on lectures, even though they knew it was not supposed to be too much. It could also mean that even though they knew they were not supposed to rely too much on the lecturers, they would have liked that to happen. Since the views of the staff were so strong, it means they should let students know about their expectations.

Question 4

Statements: A good lecturer is one who points out to students which is the one accepted view of an issue. **Vs.** I think a good lecturer should give all views on an issue and give students a chance to evaluate them.

Comparison of the university distributions for Question 4

Tables 7.1d(i & ii) and Figures 7.1d(i & ii) below show the results obtained from the two universities for Q4.

The shape of the GU distributions was not too different from the one observed in the previous questions. These distributions were typically skewed towards Perry 'C', with option 4 of this category dominating. The UB distributions were however quite different from those in the previous questions. There was an obvious increase in both Perry 'A' and 'B' thinking, and a marked decrease in Perry 'C' thinking, as compared to other questions. Though both the Perry 'A' and 'B' proportions did not reach 25%, they were still higher than it had been observed before.

Tables 7.1d (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q4

Table 7.1d(I): GU Part 1 Q4

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	1.18	2.04	1.82	0.00	3.70	0.00
2 'A'	8.42	6.63	0.00	0.00	9.26	6.67
3 'B'	17.87	18.37	12.96	13.16	7.41	15.00
4 'C'	46.97	43.88	37.04	57.89	37.04	51.67
5 'C'	24.08	28.57	48.15	28.95	42.59	25.00

Table 7.1d(ii): UB Part 1 Q4

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	8.78	9.93	8.45	14.58
2 'A'	4.88	8.61	4.23	14.58
3 'B'	21.95	23.18	19.72	22.92
4 'C'	24.39	21.19	39.44	25.00
5 'C'	40.00	37.09	26.76	22.92

Figures 7.1d (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 4

Figure 7.1d(i): GU – Part 1 Q4

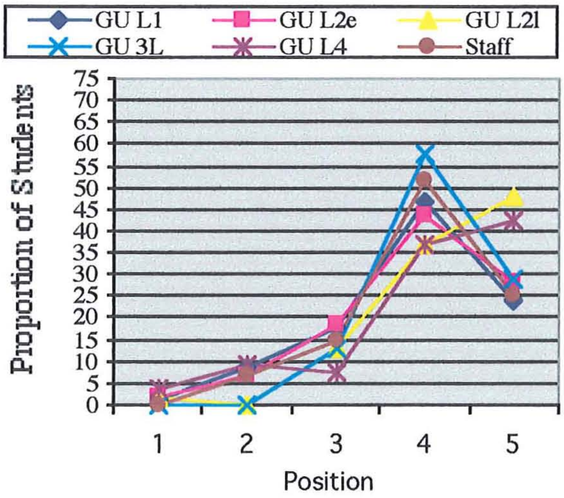
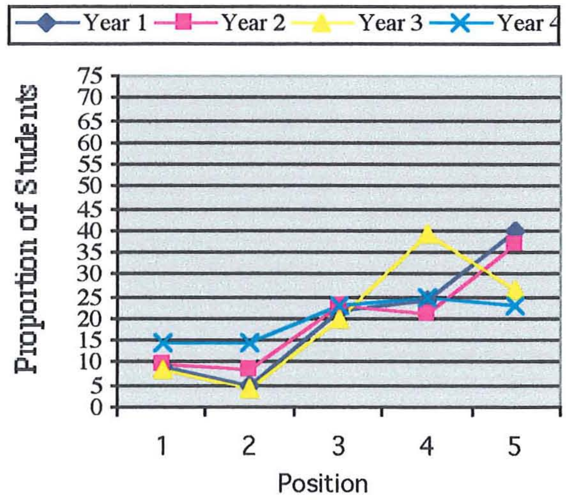


Figure 7.1d(ii): UB – Part 1 Q4



The differences could be taken to indicate that UB students were much more uncomfortable in Multiplicity than their GU counterparts. Perry 'C' thinking still dominated in the UB groups, but the fact that it was not in the same strength as in other questions gave an impression of discomfort in Multiplicity. One wonders if this might have been a result of the way the students were taught. This could either mean that the students were used to being presented with definitive views from lecturers, or they might have been exposed to multiple views, only to their discomfort. Whatever the reason for this discomfort, it is clear that these students need to be encouraged to deal with multiplicity by being exposed to it as much as possible, and by being encouraged to make their own decisions on issues.

Comparison of GU staff results with student results

Unlike with the previous three questions, the staff distribution here was found to be almost the same as those of students in that there was a clear domination of option 4 over option 5 of the Perry 'C' category. Late Level 2 and Level 4 were the only groups with option 5 dominating option 4. It was quite peculiar that there was an indication to the effect that the staff were not strongly in agreement with the presentation of multiple perspectives to students. It was clear that they agreed with this, but only did so 'mildly'. The reasons why this could have been so could not be told from these data. One could only think that if they felt this way, it might have been possible that they did not present the students with enough opportunity to deal with multiplicity, or that even if they did, they might have been uncomfortable doing so. It is obvious though that if not given the opportunity to face and deal with multiplicity in their education, the students might leave university lacking in the power to face it in their careers and in normal life.

Question 5

> **Statements**: I think lecturers should avoid teaching material that they know students will find difficult. **Vs.** Lecturers should aim to provide challenges to their students by introducing difficult topics.

The results for this question are shown in Tables 7.1e(i & ii) and Figures 7.1e(i & ii) on the next page.

Comparison of university distributions

There was, once again, a marked difference between the GU and UB distributions. The typical outlook of the dominance of option 4 on the scale in the GU distributions was maintained. The UB distributions were, however, observed to have changed a lot. Option 3 came out clearly dominant over any of the other four options on the scale, indicating that Perry 'B' thinking dominated.

UB students were therefore seen to have been more uncomfortable in dealing with challenges in the form of increased difficulty of the taught material, than their GU counterparts. This finding was in line with the observation made in Q4, where it was clear that these students were uncomfortable with challenges brought in by multiplicity.

Tables 7.1e (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q5

Table 7.1e(i): GU - Part 1 Q5

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	0.00	1.02	1.85	0.00	1.85	0.00
2 'A'	3.99	4.08	3.70	5.26	5.56	0.00
3 'B'	26.88	25.51	18.52	28.95	12.96	3.33
4 'C'	54.80	54.08	62.96	39.47	57.41	66.67
5 'C'	13.15	14.80	12.96	26.32	22.22	30.00

Table 7.1e(ii): UB - Part 1 Q5

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	7.80	14.57	7.04	14.58
2 'A'	8.78	8.61	18.31	12.50
3 'B'	42.44	44.37	50.70	31.25
4 'C'	27.80	21.85	21.13	14.58
5 'C'	13.17	10.60	2.82	27.08

Figures 7.1e (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 5

Figure 7.1e(i): GU – Part 1 Q5

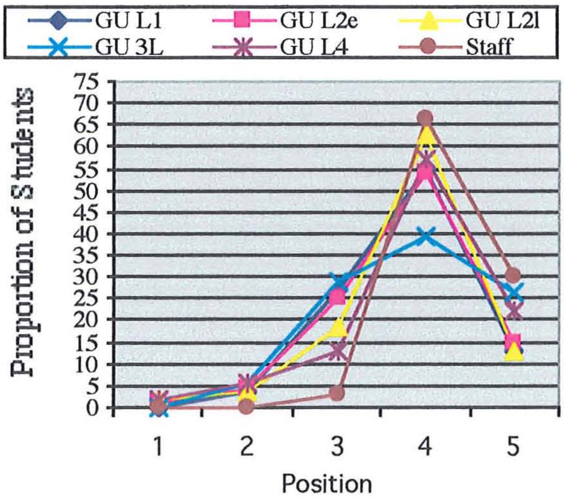
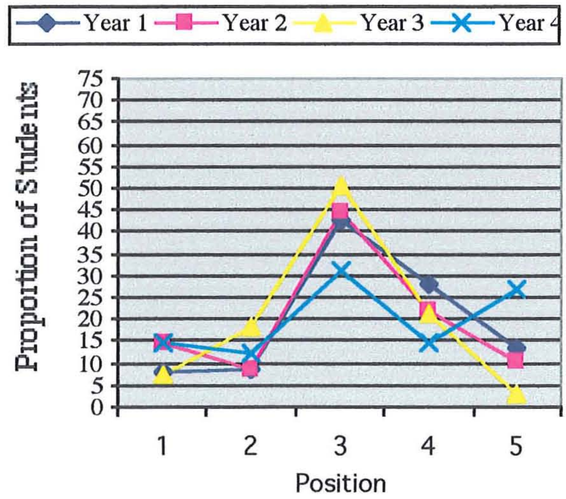


Figure 7.1e(ii): UB - Part1 Q1



It was found that these same students who had indicated in Q1 that they knew they had to exercise a lot of independence in their studies could turn out to be uncomfortable in facing challenges. This might indicate that the students wanted the easy way out. One wonders why this feeling was detected at all four levels. The students might either have been used to dealing with material that did not present too many challenges, or they might have been made to face challenges, but were not too happy about it.

Comparison of GU staff results with student results

The staff distribution was similar in shape to those of students, with option 4 being more dominant than option 5, though the staff recorded the highest proportions in both. This might indicate that though the staff appreciated the importance of challenging the students, they did not strongly agree with doing this. The results might also imply that the staff believed in presenting only 'mild levels' of challenges. If the latter were true, this would be no good to those students already performing at high levels, as there would be nothing to prompt further growth in them.

Question 6

Statements: I prefer not to work with other students because then I stand less chance of picking up wrong ideas. **Vs.** It is good to work with other students because by listening to their points of view, I can evaluate my own.

Tables 7.1f (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q6

Table 7.1f(i): GU - Part 1 Q6

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	0.00	1.53	1.85	0.00	3.70	0.00
2 'A'	1.77	3.06	3.70	2.63	0.00	1.67
3 'B'	9.60	21.94	5.56	13.16	20.37	16.67
4 'C'	54.06	46.43	59.26	39.47	31.48	43.33
5 'C'	33.09	26.02	27.78	44.74	44.44	36.67

Table 7.1f(ii): UB – Part 1 Q6

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	0.98	5.96	1.41	4.17
2 'A'	1.46	2.65	2.82	4.17
3 'B'	9.76	9.27	4.23	10.42
4 'C'	27.32	24.50	32.39	31.25
5 'C'	60.49	57.62	59.15	50.00

Figures 7.1f (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 6

Figure 7.f(i): GU – Part 1Q6

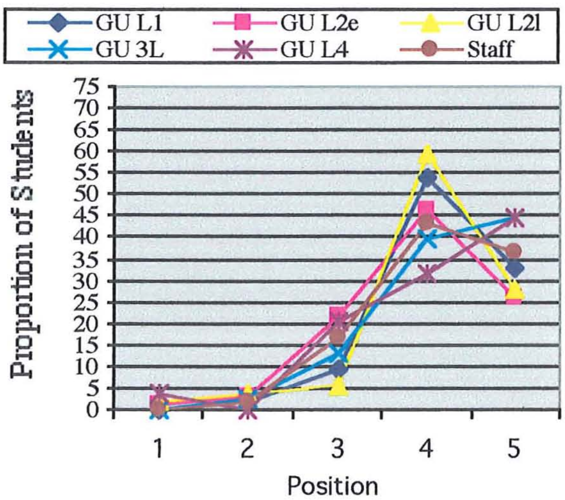
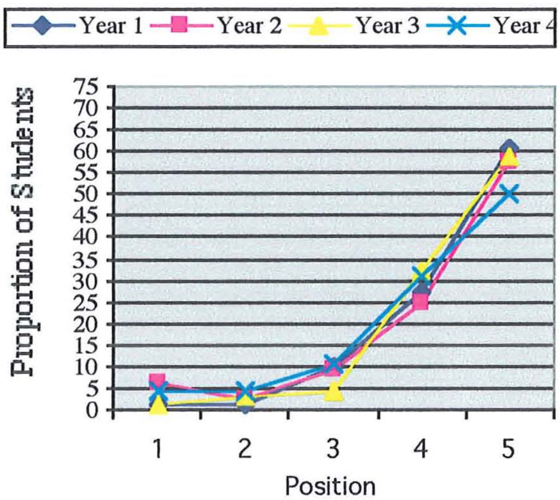


Figure 7.1f(ii): UB – Part 1 Q6



Comparison of the university distributions

As in the other questions, the GU distributions seemed to be dominated by option 4 while option 5 was more popular at UB. This can be taken to indicate that the UB students were more appreciative of their peers and probably even had more faith in them as possible sources of information.

Comparison of GU staff results with student results

The staff distribution had a similar shape as those of the students. It was, however, observed that the staff recorded a lower proportion of Perry 'C' responses than the Level 1, late Level 2 and the Level 3 group, and a higher proportion of the same than early level 2 and Level 4. This might mean that the staff group was not as keen on students working together than Level 1, late Level 2 and Level 3. This might be an indication that the staff did not see group-work as a worthwhile mode of learning for students, while the students themselves valued it more.

It was interesting to find that the groups which were thought to have been more advanced in their perceptions, according to the discussion in Chapter 6, i.e. early level 2 and Level 4, had lower Perry 'C' proportions. One could speculate that these two groups might have realised that, though potentially useful, group-work may not be the best forum for students to engage in self-evaluation (which is suggested by the question).

Question 7

Statements: All one has to do in biology is to memorise things. **Vs.** Instead of just memorising things, it is interesting to look for patterns and relationships among facts.

The results for this question are shown in Tables 7.1g(i & ii) and Figures 7.1g(i & ii).

Tables 7.1g (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q7

Table 7.1g(i): GU – Part 1 Q7

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	4.14	0.00	0.00	0.00	0.00	0.00
2 'A'	12.26	3.06	7.41	0.00	0.00	0.00
3 'B'	25.70	12.24	16.67	5.26	7.41	1.67
4 'C'	40.32	46.43	46.30	55.26	46.30	23.33
5 'C'	15.95	36.73	29.63	39.47	46.30	75.00

Table 7.1g(ii): UB – Part1 Q7

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	4.39	1.99	4.23	2.08
2 'A'	3.41	3.31	1.41	0.00
3 'B'	11.71	9.27	2.82	4.17
4 'C'	29.76	17.22	33.80	22.92
5 'C'	50.73	66.89	57.75	70.83

Figures 7.1g (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 7

Figure 7.1g(i): GU – Part 1 Q7

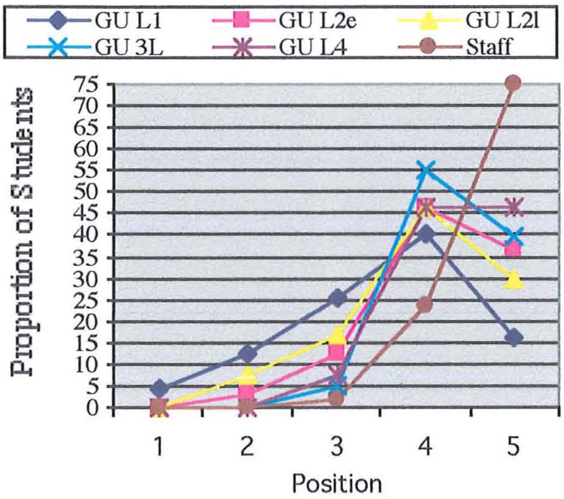
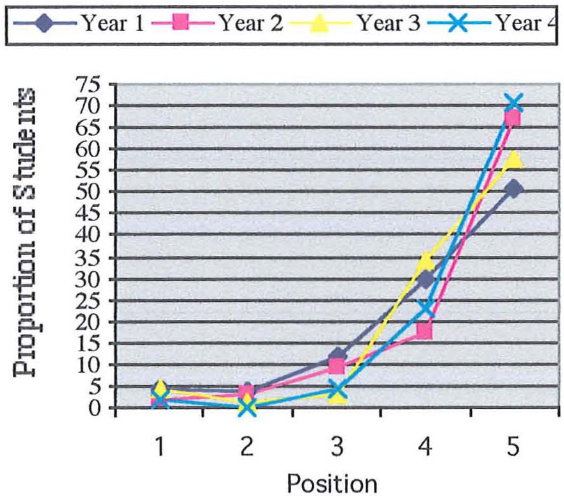


Figure 7.1g(ii): UB – Part 1 Q7



Comparison of university distributions

While UB distributions were, once again, dominated by the extreme option 5 of the Perry 'C' category, the GU distributions were mostly dominated by option 4. GU Level 4 was the only exception, it registered equal proportions of option 4 and 5. The GU students were not as strongly opposed to memorisation as the UB students. The nature of the exams GU students were made to sit might have been a contributing factor to this attitude to learning.

Comparison of staff results with student results

The staff distribution was different from those of students in that option 5 dominated. Though the perceptions of the two groups were not antagonistic, as both had predominantly Perry 'C' distributions, the staff felt more strongly than students about looking for patterns among facts instead of memorising. This could either mean that the students were not getting the message that they had to look for patterns clearly, or they simply found memorisation useful in their learning or for passing their exams. The most important thing however, is that though the agreement with linking information might not have been that strong, at the end of the day, it was there, and the students did not agree that all they had to do was memorise things.

Question 8

Statements: Science outlines a set of facts about what is happening in the world. A student needs to develop ways of memorising these facts. **Vs.** I do not believe that all scientific facts represent the 'Absolute Truth'. Students should try and understand arguments for and against existing knowledge.

Tables 7.1h (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q8

Table 7.1h (i): GU – Part 1 Q8

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	0.44	0.00	1.85	0.00	0.00	0.00
2 'A'	5.76	5.10	5.56	2.63	1.85	0.00
3 'B'	17.13	12.76	14.81	5.26	5.56	1.67
4 'C'	49.48	47.96	44.44	42.11	42.59	23.33
5 'C'	25.26	33.67	33.33	50.00	44.44	68.33

Table 7.1h(ii): UB – Part 1 Q8

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	3.90	0.00	0.00	2.08
2 'A'	4.88	5.30	0.00	2.08
3 'B'	21.95	18.54	9.86	8.33
4 'C'	32.20	26.49	45.07	22.92
5 'C'	37.07	49.67	45.07	64.58

Figures 7.1h (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 8

Figure 7.1h(i): GU – Part 1 Q8

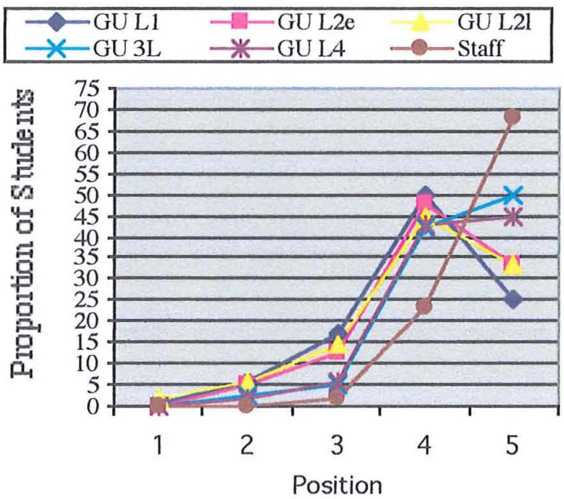
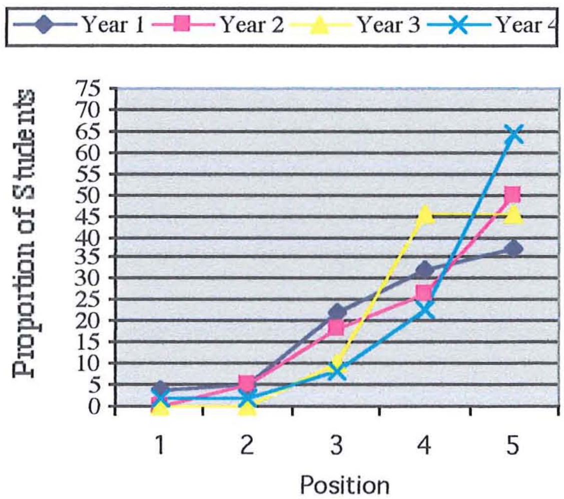


Figure 7.1h(ii): UB – Part 1 Q8



Comparison of the university distributions

Question 8 also produced the familiar trend in the difference between the distributions of the two universities. For GU, option 4 was dominant in the lower levels, and not so much in the upper levels, Levels 3 and 4. The former had much higher proportions of option 5 (50.00% vs. 42.11% for option 4), while with the latter, the difference was not that big (42.59% for option 4 and 44.44% for option 5).

It has become apparent that UB students appeared to have stronger Perry 'C' perceptions in issues relating to responsibility and reliance on lecturers, as well as those issues pertaining to nature of knowledge of science, as the shapes of the distributions show. It was interesting to note that though this might have been the case, UB students were not comfortable at facing challenges in the form of difficult issues and multiplicity in knowledge. One could then be led to think that maybe UB students just expressed what they knew to be the case or what they thought they would be expected to say, but were not necessarily ready to act the part of meeting the challenges.

Comparison of GU staff results with student results

The staff distribution once again differed from the GU students' in that option 5 was more common in the staff's than option 4. It could not be disputed that the staff's perceptions were much higher than those of students. What one continues to wonder is if this meant the students' expectations were not at par with the staff's because they should be naturally less mature, or that the staff's expectations were simply higher. Though this difference did exist, it was clear that Perry 'C' thinking dominated the students' thinking in general.

Question 9

Statements: I prefer to learn facts and be tested on them in short questions. **Vs.** I find short questions restrictive, as they do not give me the opportunity to explain what I know and understand.

The results are found in Tables 7.1h(i & ii) and Figures 7.1h (i & ii) below.

Tables 7.1i (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q9

Table 7.1i(I): GU – Part 1 Q9

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	16.10	13.26	12.96	10.53	11.11	0.00
2 'A'	27.33	24.49	22.22	10.53	14.81	6.67
3 'B'	34.56	36.22	40.74	39.47	38.89	45.00
4 'C'	12.26	18.88	14.81	23.68	25.93	31.67
5 'C'	8.42	6.63	9.26	15.79	3.70	13.33

Table 7.1i(ii): UB Part 1 Q9

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	15.61	9.27	4.23	12.50
2 'A'	12.20	7.95	7.04	2.08
3 'B'	37.56	31.13	25.35	33.33
4 'C'	19.51	25.83	33.80	29.17
5 'C'	15.12	25.17	29.58	43.75

Figures 7.1i (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 9

Figure 7.1i(i): GU – Part 1 Q9

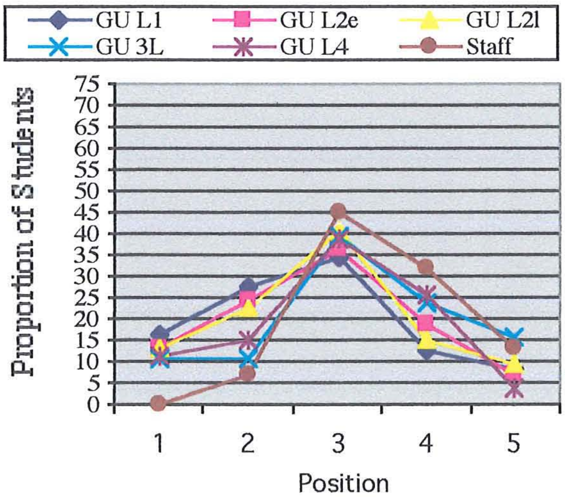
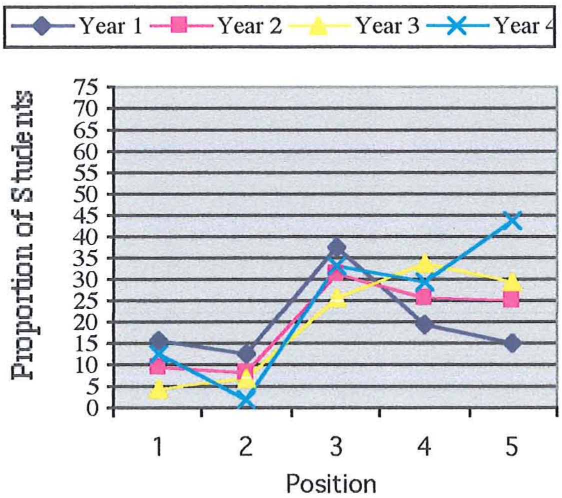


Figure 7.1i(ii): UB – Part 1 Q9



Comparison of university distributions

The difference between the distributions for the two universities was quite notable. The GU were clearly bell-shaped, with the Perry 'B' option 3 being modal at all levels. This suggested that the students were generally neither opposed to nor in support of the use of short questions in assessment. This could be taken to imply that though the GU students might have known that short questions were not particularly good for assessing their level of understanding, they still preferred to be assessed using them. The UB distributions had a different outlook altogether. Figure 7.1i(ii) shows that there appeared to have been a fair split of proportions of students among options 3, 4 and 5.

Perry 'C' thinking can be said to be dominant in the UB distributions, as both option 4 and 5 are part of the Perry 'C' category. It was however clear that Perry 'B' proportions were higher than the separate options 4 and 5 proportions, at lower levels, Year 1 and Year 2, but lower than each of these two options at Year 3 and 4. The Perry 'C' values indicated that the perceptions of the students were better up the ladder than below. These Perry 'B' values were however still very high compared to those recorded in other questions, except Q5, where they were seen to be highest. It can be concluded though that the UB students were not as uncomfortable with offering their own opinions as the GU students were.

Comparison of GU staff results with GU student results

As already mentioned in Chapter 6, there appeared to have been more to the issue of assessment than the students just wanting the easy way out. The staff distribution assumed the same bell-shape as the students'. This suggested that the staff themselves were not too sure about the use of short questions in assessment. What this could mean is that the staff might have short questions for their convenience in marking and hence reduction of their workload, but at the same time knew these were not best for assessing students;' understanding. This obviously sends a wrong signal to the students, who might end up confused, as the results showed. Short questions are not the best tool for assessment, as they cannot help develop complex thinking in students. Perry (1999) argues that students who become more complex in their thinking in the classroom could apply that thinking to the complexities of citizenship in the real world.

Question 10

Statements: In exams I prefer questions which are based on what the lecturer taught. **Vs.** In exams I prefer questions that demand thinking beyond what is taught in class.

The results are shown in Tables 7.1j (i & ii) and Figures 7.1j (i & ii).

Tables 7.1j (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q10

Table 7.1j(i): GU – Part 1 Q10

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	22.90	23.47	38.89	26.32	12.96	3.33
2 'A'	36.63	34.69	33.33	50.00	33.33	11.67
3 'B'	25.11	29.59	20.37	13.16	25.93	23.33
4 'C'	11.52	9.18	7.41	7.89	16.67	41.67
5 'C'	2.36	2.55	0.00	2.63	5.56	15.00

Table 7.1j(ii): UB – Part 1 Q10

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	42.93	50.33	39.44	50.00
2 'A'	21.43	13.25	19.72	12.50
3 'B'	21.95	21.85	23.94	14.58
4 'C'	6.83	9.27	11.27	12.50
5 'C'	6.83	4.64	5.63	10.42

Figures 7.1j (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 10

Figure 7.1j(i): GU – Part 1 Q10

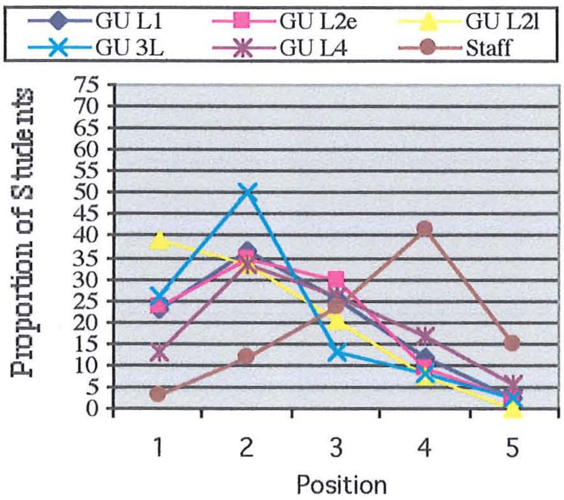
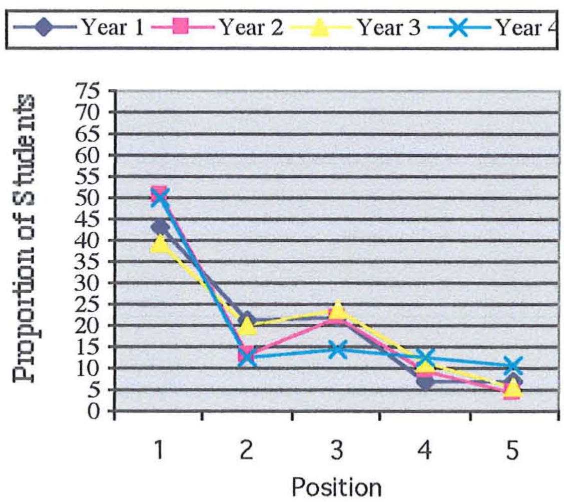


Figure 7.1j(ii): UB – Part 1 Q10



Comparison of university distributions

Question 10 produced student distributions whose shapes appeared like mirror images of those observed in most of the other questions (see Figures 7.1j (i & ii)), for both universities. The student distributions were all skewed towards Perry 'A' thinking. In the GU distributions option 4 was replaced by option 2 the milder option of the Perry 'A' category, in the dominant position that it occupied in the other questions. In the case of UB distributions, option 5 was replaced by the stronger option of the Perry 'A' category, option 1. This finding was important as it served to further clarify the fact that UB students tended to agree more with extremes of the categories than their GU counterparts. Whether this could have been due to the convenience of picking the extreme position, which was next to the statement (and therefore making the decision-making process less laborious) or whether they were indeed more intellectually advanced could not easily be told from this data alone.

What this data has definitely confirmed is that the students tend to regress to lower levels of perceptions when confronted with assessment issues. Though the results from Q1 indicated that the students in both universities knew they had to work some things out themselves without relying too much on the lecturers, they still indicated they preferred not to be asked questions demanding thinking beyond what is taught in class.

This finding all boils down to the students' knowledge of their responsibilities, and yet wanting to pass with as little effort as possible. Offering students no such opportunities, but making sure they get to exercise the responsibilities they only know too well about, can only discourage this kind of thinking.

Comparison of GU staff results with GU student results

Figure 7.1j(i) shows a clear case where the students' perceptions were totally opposed to those of staff. While the students' distributions were skewed towards Perry 'A' thinking. Those of staff were almost their mirror image, skewed towards Perry 'C' thinking. This finding agrees with Wilson's (1981) assertion that there is always a lack of synchrony between staff and students' views of assessment. He states that:

> ...With regard to assessment...staff award grades to reflect their judgement of a student's ability and interest and effort he has put into doing the assignment. But their expectations are idealistic and unrealistic since they forget that for the majority of the students' social life, personal interest and vocational plans (which do not include a career in research or higher education) conflict with the simple dedication to academic stuff which staff imagine... (pp. 44-45)

It appears that all students are interested in making the pass mark, and achieving this through the easiest way possible. Wilson further states that ideas of excellence and scholarship, as defined by staff, are not among the constructs through which the majority of students interpret and evaluate the process of higher education, but their definition of excellence extends only to the quality of teaching. It is no wonder then that they would want to be assessed only on what staff have taught. This difference in expectations of staff and students is what most systems should be aware of, so that it can be dealt with in ways that would be beneficial to the students. Students need to be informed that their 'near-sightedness' would not be beneficial for them in the future, where more will be expected of them.

Question 11

Statements: In exams, I expect to be rewarded for giving as much information as possible. **Vs.** I believe what should matter in exams is the quality of my answers, not how much I write.

Tables 7.1k (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q11

Table 7.1k(i): GU Part 1 Q11

Pos.	Level 1	Early Level 2	Late Level 2	Level 3	Level 4	Staff
1 'A'	2.36	2.04	3.70	0.00	0.00	0.00
2 'A'	6.35	7.65	3.70	5.26	7.41	1.67
3 'B'	16.10	16.33	22.22	7.89	9.26	3.33
4 'C'	38.55	41.84	35.19	36.84	38.89	36.67
5 'C'	34.86	31.63	35.19	50.00	38.89	53.33

Table 7.1k(ii): UB Part 1 Q11

Pos.	Year 1	Year 2	Year 3	Year 4
1 'A'	5.85	9.27	2.82	6.25
2 'A'	2.93	1.32	5.63	0.00
3 'B'	17.07	11.92	14.08	4.17
4 'C'	12.20	15.89	22.53	16.67
5 'C'	61.95	60.93	54.93	72.92

Figures 7.1k (i & ii): Percentage Distributions of Students among the Questionnaire Scale Options for Q 11

Figure 7.1k(i): GU – Part 1 Q11

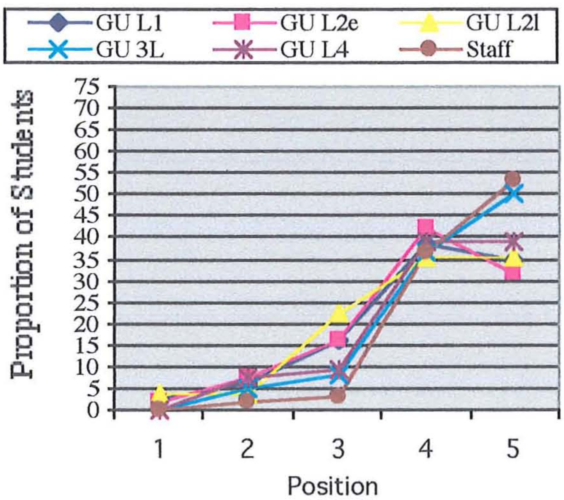
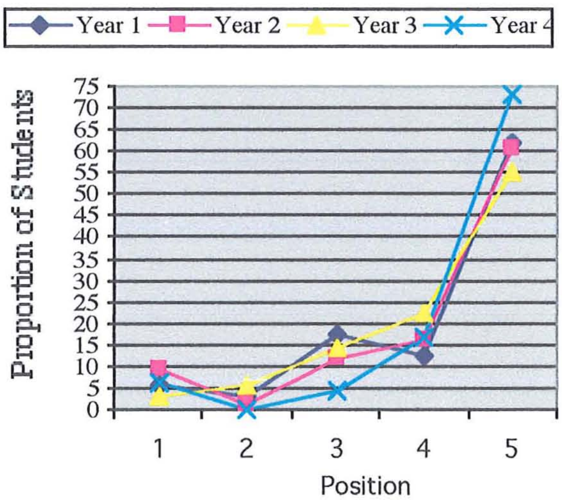


Figure 7.1k(ii): UB – Part 1 Q11



Comparison of university distributions

The difference between the two universities was evident again in this question. The UB distributions were, without doubt, dominated by option 5 of the Perry 'C' category. Option 4 did not come out too dominant this time, in the GU distributions. It was slightly dominant only at Level 1 and early Level 2. For late Level 2 and Level 4, there were equal option 4 and 5 proportions. Level 3 was the only one with Level 5 clearly dominating option 4. The general outlook though, from Figure 7.1k(i), was that neither of the two Perry 'C' options was too dominant over the other in the GU distributions.

Comparison of staff results with GU student results

The staff distribution was clearly skewed towards the extreme end of the Perry 'C' category, rendering option 5 more dominant over option 4. Though the difference did exist between the two groups, it is important to note that both the staff and the students did agree, to differing degrees, on quality taking precedence over quantity in assessment.

7.2.2 Directions of intellectual growth in the two universities

So far the results have shown how the students in the two universities and the staff were distributed amongst the different options along the scale of the Perry categories. This part of the discussion will focus on how the students in the different levels within each university were distributed in the different questions. This will give an idea if the students in the two universities followed a similar or different line of development. It is in this part of the discussion that issues like the 'sophomore slump' mentioned by Grinnell (1987) (see Chapter 6, page 118) can be investigated.

7.2.2.1 Determination of the direction of intellectual progression at UB

In Chapter 6, it was observed that there might have been obstacles that GU students met at some points during their courses that negatively affected their attitudes to some aspects of their learning. The progress of UB students was also investigated. As in Chapter 6, the levels were placed according to increasing values of Perry 'A' and 'B' proportions, and decreasing values of Perry 'C' proportions for each question. The most advanced level in each question would therefore have the lowest Perry 'A' and 'B' proportions, and the highest Perry 'C' proportion, and would come first in the rankings. The least advanced would have the highest Perry 'A' and 'B' proportions, and the lowest Perry 'C' proportion, and would therefore come last in the ranks. The level that came first in any rank was given a number 1 position, and the one coming last a number 4. The rank-orders were based on Tables 7.1a-k (ii) and are summarised in Table 7.2 below.

Table 7.2: Rank-orders of the Different UB Levels over the Three Perry Categories for each Question in Part 1 (1=most advanced: Lowest Perry 'A' and 'B' proportions or highest Perry 'C' proportion; 4=least advanced: Highest Perry 'A' and 'B' proportions or lowest Perry 'C' proportion)

Level of Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Perry 'A'											
Year 1	1	2	1	2	1	1	4	4	4	4	3
Year 2	3	3	3	3	2	4	2	3	3	3	4
Year 3	4	4	2	1	3	2	3	1	1	1	2
Year 4	2	1	4	4	4	3	1	2	2	2	1
Perry 'B'											
Year 1	3	3	3	2	2	3	4	4	4	3	4
Year 2	2	2	4	4	3	2	3	3	2	2	2
Year 3	4	1	2	1	4	1	1	2	1	4	3
Year 4	1	4	1	3	1	4	2	1	3	1	1
Perry 'C'											
Year 1	2	4	2	2	2	2	4	4	4	4	4
Year 2	3	1	2	3	3	3	3	3	3	3	3
Year 3	4	3	3	1	4	1	2	1	2	2	2
Year 4	1	2	1	4	1	4	1	2	1	1	1

The level(s) with the highest number of questions for each position in the rank-order was determined from the table above and highlighted in **bold** and *Italics.* It has to be remembered that position 1 means the group had the highest proportion of Perry 'C's and lowest proportion of Perry 'A' or 'B', and was therefore regarded as the most advanced. As in Part 1, these results were only given a qualitative and not a statistical analysis. As a result, only an estimate of the positions of the levels in the three Perry categories can be determined from Table 7.2 above. Of most importance to the analysis is the determination of which levels tend to be either at the beginning (most advanced) or the end (least advanced) of the ranks.

Perry 'A' Rank-order:

The allocation of the positions in the Perry 'A' ranks makes it difficult to determine which one generally produced the highest or lowest proportions of Perry 'A' thinkers. However, the conclusion that can be made on the basis of these rank-orders is that there was obviously no smooth progression from Year 1 to year 4. Even so, the proportions of Perry 'A' thinkers alone do not give enough ground for solidifying this conclusion. Perry 'B' and 'C' proportions also need to be looked at.

Perry 'B' Rank-order:

A bird's eye look at the Perry 'B' ranks suggests that Year four students might have been the most advanced, as they had the highest number of questions where they came first in the ranks or produced lowest Perry 'B' proportions. Year 3 students were the next in the list of lowest Perry 'B' proportions. The results also seem to suggest that Year 1 might have been the least advanced, as they registered the highest number of questions in which they came fourth in the ranks. This would therefore place Year 2 at position 3 in the rank. It has to be noted though that this is only an estimate of the rank-order, that might end up not necessarily being confirmed by the statistical analysis.

Perry 'C' Rank-order:

The generally Perry 'C' rank-order was less obscure than those of the other two categories. It was much clearer that Year 4 came first in the ranks most of the time, followed by Years 3, 2 and 1 in that order. This confirms the estimate rank-order in the Perry 'B' category. Though these estimates give an idea of intellectual progression occurred at UB, this has to be investigated statistically.

7.2.3 Chi-square comparisons of Part 1 results for the different UB groups

A chi-square analysis of the results was carried out to find out if the different groups' distributions among the five options on the scale for each of the eleven questions were significantly different. Raw frequencies were used for this purpose. Each group's distribution was compared to that of each of the other groups. The results from these comparisons are shown in Table 7.3 below. The highest degrees of freedom should be 4, as there were 5 options. In some cases, when the chi-square value was calculated, there were some cells in which the expected frequencies turned out to be lower than 5%. This could not be accepted, and so some cells had to be pooled together to create cells with larger expected frequencies. This resulted in the degrees of freedom being reduced. A chi-square value less than the critical value for particular 'degrees of freedom' would mean that the two distributions compared were not significantly different at a particular significance level.

Table 7.3: Chi-square Values for the Comparison of the Distributions of the Different UB Groups (Part 1)

Question	Year 1 vs. Year 2	Year 1 vs. Year 3	Year 1 vs. Year 4	Year 2 vs. Year 3	Year 2 vs. Year 4	Year 3 vs. Year 4
1	1.61 df=3	**20.32 df=3**	1.98 df=2	**14.89 df=3**	2.87 df=2	**16.73 df=2**
2	3.69 df=3	1.20 df=2	3.60 df=2	5.15 df=3	0.66 df=2	5.68 df=2
3	8.96 df=4	1.86 df=3	0.13 df=2	**9.08 df=3**	5.02 df=3	0.95 df=2
4	2.63 df=4	6.95 df=3	**15.32 df=3**	**8.77 df=3**	4.42 df=4	6.09 df=3
5	5.50 df=4	**9.29 df=3**	3.52 df=2	7.23 df=3	**9.85 df=4**	7.64 df=3
6	6.95 df=3	1.15 df=2	2.19 df=2	4.02 df=2	1.02 df=2	2.86 df=2
7	**10.84 df=3**	4.65 df=2	**7.55 df=2**	**7.92 df=2**	2.70 df=2	2.12 df=2
8	6.13 df=3	**12.38 df=2**	**12.80 df=2**	**10.23 df=2**	3.92 df=2	**6.13 df=2**
9	**11.34 df=4**	**18.90 df=3**	**27.34 df=3**	3.09 df=3	**9.26 df=3**	4.42 df=3
10	5.67 df=4	0.71 df=3	5.21 df=3	2.91 df=3	2.80 df=3	3.40 df=3
11	2.73 df=3	4.52 df=3	5.37 df=2	1.87 df=3	3.54 df=2	4.36 df=2

CHI-SQUARE CRITICAL VALUES

Significance Level	**0.05**	**0.01**
Degrees of freedom = 1	3.84	6.64
Degrees of freedom = 2	5.99	9.21
Degrees of freedom = 3	7.82	11.34
Degrees of freedom = 4	9.49	13.28

The values in bold show instances where the difference between the two levels compared was significant. The comparison starts between Year 4 and the other groups, as they were shown to have been the most advanced, from the rank-orders. The difference between Year 4 and Year 3 students was significant only in two instances, Q1 and Q8. In Q1, Year 4 recorded a higher proportion of Perry 'C' and lower proportions of both Perry 'A' and 'B' proportions.

This means Year 4 was therefore more advanced in respect of Q1. In Q8, Year 4 had a higher proportion of Perry 'A', a lower proportion of Perry 'B', and a lower Perry 'C' proportion than Year 3. This puts Year 3 at a more advanced level. Putting the two questions together however, puts Year 4 at an advantage as it had a lower Perry 'B' proportion in Q8. So, though the two levels might have appeared not to be significantly different, Year 4 was a little bit more advanced than Year 3. This agrees with the rank-order suggested in 7.2.2. The order could then be concluded to be *Year 4 > Year 3*.

When Year 4 was compared with Year 2, there were two questions (Qs 5 & 9) in which the differences were significant. In both questions, Year 4 was more advanced than Year 2 judging from the Perry 'A', 'B' and 'C' proportions. Comparing Year 4 with Year 1 showed that the differences were significant for Qs 4, 7, 8, & 9. In the last three of these questions, Year 4 was more advanced than Year 1, on the basis of the Perry 'A', 'B' and 'C' proportions generated. It can be assumed that these results indicate that Year 4 was more advanced both Year 1 and Year 2. On the basis of the number of questions in which this level was more advanced than the others, it can also be assumed that Year 3 > Year 2 > Year 1 (with the '>' sign indicating 'more advanced'). However, further comparisons are made based on the results above.

Comparing Year 3 with other levels showed that there were five instances (Qs 1, 3, 4, 7 & 8) where it was significantly different from Year 2, and four (Qs 1, 5, 8 & 9) in which it was significantly different from Year 1. In the case of Year 2, Q1 was the only one in which Year 3 was less advanced than Year 2 in that it had higher proportions of Perry 'A' and 'B', and a lower Perry 'C' proportion. In all the other questions, Year 3 was more advanced. That led to the conclusion that: *Year 4 > Year 3 > Year 2*.

In Qs 1 and 5, Year 3 was less advanced than Year 1 as it had higher proportions of Perry 'A' and 'B' and lower Perry 'C' proportions. In Qs 8 and 9, Year 3 was more advanced than Year 1 as it had lower proportions of Perry 'A' and 'B', and higher Perry 'C' proportions. These results place Year 3 and Year 1 at a tie, and this can only be resolved by comparing these two groups with others.

Comparing Year 1 with Year 2 gave only two instances where the differences were significant, while there were five such instances when comparing it with Year 2. As already discussed above, Year 3 proved to be more advanced in four out of five of those instances. On comparing Year 1 with Year 2, it was found that the differences were significant in Qs 7 and 9. In both cases Year 2 was more advanced than Year 1 in that it had lower Perry 'A' and 'B' proportions and higher Perry 'C' proportions. These results led to the conclusion that Year 3 was more advanced than Year 2, and Year 2 more so than Year 1. The tie between Year 1 and Year 3 was therefore resolved, and the levels could be placed in the following order of advancement, with the most advanced first:

Year 4 > Year 3 > Year 2 > Year 1

This rank-order agrees with that suggested in Section 7.2.2. From these results, it can be concluded that intellectual growth in UB students increased linearly and gradually as the students progressed from year to year in their courses. If at all the students experienced any setbacks at any point in their courses, this was not quite significant, and therefore readily observable in these results, unlike with the GU results.

It should be borne in mind however, that the problems observed at GU were observed at late Level 2, while data collection at UB occurred during the early part of the year. This can therefore not rule out the possibility that there might have been problems during the other times of the year. The evidence of more confusion at early Year 3 discussed in Section 7.2.2 might be an indication that there might have been problems during the Year 2 period that might have led to students reaching early Year 3 in a confused state.

7.2.4 A Chi-square comparison of Part 1 results of Universities of Botswana and Glasgow

The main reason why the two universities were compared was not so much to find out which one produced more intellectually mature students, but more to find out whether the students in the two universities more or less went through similar routes of development. Comparing the perceptions of students at similar levels in the two universities might shed light on how they differed. It should, however, be borne in mind that it is possible that there may be a lot of factors that might lead to the differences in speed of development in two different institutions. It is possible for instance, that a university with older students might appear like it is producing more intellectually mature students, whereas this could be a result of maturity brought about by their advanced chronological age. A university with more advanced syllabi and more challenging activities for students could also manage to produce students appearing to be more intellectually mature. It should be noted however, that in the case of these two universities, the students generally enter First Year at around the same age, about 18 years of age.

Table 7.4 below shows the chi-square values calculated for these comparisons. The degrees of freedom (df) differ because in some cases, when the chi-square statistic was calculated, there were some cells in which the expected frequencies were less than 5%, so some cells had to be pooled together. The critical values, taken from Lewis (1967) are given below the table.

Table 7.4: Chi-square Values for the Comparison of the Distributions for the Different Levels at University of Botswana and Glasgow University (Part 1)

Question 1	UB Year 1 versus GU Level 1	UB Year 2 versus GU early L2	UB Year 2 versus GU Late L2	UB Year 3 versus GU Level 3	UB Year 4 versus GU Level 4
1	**63.4 df=3**	**32.91 df=3**	**29.54 df=3**	5.09 df=2	5.93 df=2
2	**75.41 df=3**	**30.71 df=3**	**20.15 df=2**	2.46 df=2	**6.81 df=2**
3	**28.33 df=4**	**35.82 df=4**	**15.50 df=3**	1.58 df=2	0.14 df=2
4	**67.83 df=4**	**22.12 df=3**	**13.47 df=2**	5.42 df=2	**11.37 df=2**
5	**71.74 df=3**	**53.73 df=3**	**34.51 df=3**	**18.30 df=1**	**22.33 df=2**
6	**53.10 df=3**	**42.96 df=3**	**22.71 df=2**	2.52 df=2	0.50 df=2
7	**108.65 df=4**	**38.87 df=3**	**25.13 df=2**	**5.78 df=1**	**6.27 df=1**
8	**21.44 df=3**	**17.41 df=3**	**6.49 df=2**	0.24 df=1	3.08 df=1
9	**28.34 df=4**	**37.15 df=4**	**15.40 df=4**	5.98 df=3	**17.67 df=2**
10	**46.64 df=4**	**36.00 df=4**	**8.76 df=2**	**11.65 df=2**	**17.63 df=3**
11	**70.50 df=4**	**36.51 df=3**	**12.71 df=2**	3.08 df=2	**10.39 df=2**

CRITICAL VALUES (from Lewis (1967))

Significance Levels	*0.05*	*0.01*
Degrees of freedom = 1	3.84	6.64
Degrees of freedom = 2	5.99	9.21
Degrees of freedom = 3	7.82	11.34
Degrees of freedom = 4	9.49	13.28

The values in **bold** signify instances where the differences between the groups were significant. The results indicate that for all questions, there were significant differences between UB Year 1 and GU Level 1; UB Year 2 and GU early Level 2; and UB Year 2 and GU late Level 2. The appearance of instances where the differences were not significant at 3rd Year and 4th Year indicates that at upper levels, the differences were not as significant as during the earlier years. It was however evident that the extent of the differences was larger at 4th Year than it was at 3rd Year, as there were more questions in 4th Year where the differences were significant.

It could be speculated that the observed huge difference between the students at lower levels could be due to their different backgrounds, as they come from different High School cultures. The differences could have been due to different syllabi as well as different cultures. It was observed, for example, that in most cases, the UB students showed stronger agreements with Perry 'C' statements than their GU counterparts, but in the case of Q4, which referred to adherence to already accepted views, their agreements were not as strong as those of GU students. In most African cultures, especially in Botswana, there is strong emphasis on respect for adults and adherence to pre-existing order. Children and youngsters are often forewarned against not listening to their elders and breaking cultural rules, and often told that something horrid might happen to them if they did so. It is possible then that the students might expect their lecturers to model pre-existing order for them to follow.

Perry (1999) states that he and his colleagues conducted some studies in which they investigated cultural perspectives and values, in relation to the development of students. It is reported, for instance, that in their study of culture cues they observed that first generation Asian American students often indicated a complexity of thought consistent with relativism and at the same time used phrases of respect and adherence to learned authorities that have been associated with the more dualistic or early multiplistic forms of thinking. Perry asserts that in this case, such students are not dualistic, but are reflecting appropriate cultural perspectives.

Most Botswana Secondary Schools are based in traditional rural villages, where a brush with western culture is a rarity. Most meet a much more relaxed western culture only when they reach university level, as the only university in the country is placed in the capital city. The same culture that fosters respect for Authority and order fosters independence, as most African children do not grow up too dependent on parents. Most take up responsibility for looking after livestock and their younger siblings at earlier ages, which might explain why UB students went for more extreme options of Perry 'C' statements alluding to independence from lecturers.

It is not surprising therefore to find that there were lots of differences between the lower levels, with the differences narrowing down at higher levels. One can then assume that the university culture, that should be present in all tertiary institutions, should be the cause of this bridging of the differences as students progress through their courses. The results could therefore be taken to support Perry's claim that university or college experience does promote intellectual and ethical development in students all over the world, regardless of their origin.

It was also interesting to observe that the differences were less significant between the 3rd Year groups, and more so between the 4th Year groups. One could argue that the university culture could have been felt most at 3rd Year, resulting in the 3rd Year groups in the two universities being not so significantly different. At 4th Year, the students' responses to this culture could differ depending on their background, especially the type of curriculum they go through. This would then explain why the differences would seem more significant than they were at 3rd Year.

Having looked at the differences between and within universities, a statistical analysis of the differences between staff and students, discussed earlier seems in order.

7.2.5 Chi-square comparisons between the perspectives of GU staff and students

The analysis in 7.2.2 showed that staff tended to show stronger agreements with Perry 'C' statements in most questions than students. There seemed not to be much of a difference where the issue of exam format was concerned. The staff and students' perspectives were totally opposed, however, when it came to the issue of exam content. In this section, not much emphasis will be placed on the themes of the questions, but rather on the extent to which the different levels' perspectives differed from those of staff. This will be quantified on the basis of how many questions each level was significantly different from staff. Though very simplistic, the comparisons should also be able to give an idea as to how the different levels compare themselves. Table 7.5 below shows the different chi-square values and their degrees of freedom.

Table 7.5: Chi-square Values for the comparison between GU Staff and Students' Distributions (Part 1)

Question	Staff vs. Level 1	Staff vs. L2e	Staff vs. L2l	Staff vs. Level 3	Staff vs. Level 4
1	**43.30 df=1**	**32.83 df=2**	**32.27 df=1**	**15.18 df=1**	**9.92 df=2**
2	**120.43 df=1**	**47.43 df=1**	**36.31 df=1**	**24.76 df=1**	**19.96 df=1**
3	**64.39 df=1**	**55.44 df=1**	**34.32 df=1**	**20.85 df=1**	**11.96 df=1**
4	0.97 df=2	1.34 df=2	**6.31 df=2**	1.21 df=2	4.01 df=2
5	**12.26 df=1**	**6.99 df=1**	**4.82 df=1**	0.16 df=1	0.89 df=1
6	3.65 df=2	3.19 df=2	3.10 df=2	0.54 df=2	1.92 df=2
7	**114.35 df=1**	**26.16 df=1**	**23.52 df=1**	**12.37 df=1**	**9.88 df=1**
8	**56.00 df=1**	**27.57 df=1**	**17.58 df=1**	**5.28 df=1**	**7.66 df=1**
9	**21.89 df=2**	3.06 df=1	**6.43 df=2**	0.92 df=2	2.62 df=1
10	**80.04 df=2**	**61.53 df=2**	**35.98 df=1**	**34.80 df=1**	**17.77 df=2**
11	**9.59 df=1**	**11.18 df=1**	**4.90 df=1**	**0.35 df=1**	2.41 df=1

CRITICAL VALUES (from Lewis (1967)

Significance Level	**0.05**	**0.01**
Degrees of freedom = 1	3.84	6.64
Degrees of freedom = 2	5.99	9.21

The degrees of freedom vary since in some cases when the chi-square value was calculated, there were cells that had expected frequencies lower than 5%, so these had to be pooled together because otherwise the statistic could prove erroneous. The critical values, taken from Lewis (1967), are shown below the table.

The values in bold show instances where the differences between the staff and any of the groups differed significantly. The distributions in Section 7.2 showed that there were differences in the extent to which the staff and the students agreed with Perry 'C' statements, with the staff's perceptions being stronger or more advanced. From the number of questions in which the staff's results differed significantly from those of students, it can be judged which level was not too significantly different from the staff, and which was more so. The students' distributions were significantly different from those of staff in the following number of questions:

• ***Level 1***:	9 questions
• ***Late Level 2***:	10 Questions
• ***Early Level 2***:	8 questions
• ***Level 3:***	6 questions
• ***Level 4:***	6 questions.

The results seemed not only to confirm that the staff population generally had perceptions that differed significantly from those of the students, but also seemed to confirm the findings in Chapter 6. These results show that Level 4 students were definitely more advanced than the other groups, and that the late Level 2 group was the least so.

Table 7.4 shows that the staff's perceptions did not differ significantly from the students' in Q6. Both groups agreed to the fact that it is good for students to work with others to help evaluate their own points of view. Another question in which the staff's perceptions did not differ significantly from the students (except Late Level 2), is Q4, in which they all generally agreed that a good lecturer would give all views on an issue and give students a chance to evaluate them. In both these questions the staff did not differ significantly from the students because they all agreed mildly to these Perry 'C' statements, whereas in the other questions the staff's agreements were either stronger than the students' were or opposed to them.

7.3 Comparison of the Results from Part 2 of the Questionnaire

In this section, the differences observed between GU and UB students as well as staff will be investigated further. An attempt will be made to find out what might have caused the differences, through scrutiny of the statements given in Appendixes 7 (a-f), 11(a-f) and 12(a-f). The discussion will begin with an item-by-item analysis, comparing the GU students' perceptions firstly with those of the UB students, and then with those of GU staff.

The distributions derived from categorising the statements will also be used to try to suggest a possible direction of development students follow as they progress through their courses. The precision with which Part 1 and Part 2 can manage effectively to detect true perceptions is expected to differ to some extent, because of their different formats. The results from the two sections will therefore be merged to come up with a much more plausible line of development.

7.3.1 An Item-by-item analysis of Part 2 results

Table 7.6: A Summary of the Proportions of UB Students Giving Statements under the Three Perry Categories in Part 2

	PERRY 'A'	PERRY 'B'	PERRY 'C'	OTHER
Q. 1	%	%	%	
Year 1	20.00 + *(5.85)* = 25.85	4.88 + *(3.41)* = 8.29	63.90 + *(1.95)* = 65.85	
Year 2	11.92 + *(7.95)* = 19.87	5.30 + *(1.99)* = 7.29	68.21 + *(4.64)* = 72.85	
Year 3	12.68 + *(5.63)*= 18. 31	11.27 + *(7.04)* = 18.31	57.75 + *(4.22)* = 61.97	1.41 (Q misconstrued)
Year 4	10.42 + *(0.00)* = 10.42	8.33 + *(0.00)* = 8.33	79.17 + *(2.08)* = 81.25	
Q. 2				
Year 1	1.95 + *(0.49)* = 2.44	4.39 + *(0.98)* = 5.37	86.82 + *(5.37)* = 92.19	
Year 2	2.65 + *(0.07)* = 2.65	6.62 + *(1.32)* = 7.95	83.44 + *(5.96)* = 89.40	
Year 3	5.63 + *(0.00)* = 5.63	5.63 + *(2.82)* = 8.45	76.06 + *(9.86)* = 85.92	
Year 4	2.08 + *(2.08)* = 4.16	4.17 + *(4.17)* = 8.34	87.50 + *(0.00)* = 87.50	
Q. 3				
Year 1	1.95 + *(0.49)* = 2.44	1.46 + *(1.46)* = 2.92	70.73 + *(13.17)* = 83.90	10.74 (Q misconstrued)
Year 2	0.00 + *(0.66)* = 0.66	0.66 + *(0.00)* = 0.66	79.48 + *(13.90)* = 93.38	5.30 (Q misconstrued)
Year 3	1.41 + *(0.00)* = 1.41	2.82 + *(1.41)* = 4.23	61.97 + *(12.68)* = 74.65	19.72 (Q misconstrued)
Year 4	4.17 + *(0.00)* = 4.17	0.00 + *(0.00)* = 0.00	75.00 + *(6.25)* = 81.25	14.58 (Q misconstrued)
Q. 4				
Year 1	16.12 + *(0.00)* = 16.12	11.24 + *(1.95)* = 13.19	61.45 + *(9.27)* = 70.72	
Year 2	11.92 + *(1.99)* = 13.91	8.61 + *(0.66)* = 9.27	62.91 + *(13.91)* = 76.82	
Year 3	7.04 + *(1.41)* = 8.45	14.09 + *(2.82)* = 16.91	61.97 + *(12.68)* = 74.65	
Year 4	6.25 + *(0.00)* = 6.25	14.58 + *(0.00)* = 14.58	64.58 + *(14.58)* = 79.16	
Q. 5				
Year 1	28.78 + *(9.76)* = 38.54	29.76 + *(2.44)* = 32.20	28.29 + *(0.98)* = 29.27	
Year 2	30.46 + *(9.93)* = 40.39	35.77 + *(0.66)* = 36.43	21.19 + *(1.99)* = 23.18	
Year 3	40.85 + *(7.04)* = 47.89	32.39 + *(2.82)* = 35.21	16.90 + *(0.00)* = 16.90	
Year 4	50.00 + *(4.16)* = 54.16	37.50 + *(0.00)* = 37.50	8.33 + *(0.00)* = 8.33	
Q. 6				
Year 1	13.17 + *(6.34)* = 19.51	27.81 + *(7.80)* = 35.61	38.05 + *(6.83)* = 44.88	
Year 2	16.56 + *(5.96)* =22.52	19.87 + *(9.93)* = 29.80	34.44 + *(13.26)* = 47.70	
Year 3	14.10 + *(7.04)* = 21.14	23.95 + *(14.08)* = 38.03	28.21 + *(12.68)* = 40.89	
Year 4	12.50 + *(2.08)* = 14.58	20.83 + *(2.08)* = 22.92	56.25 + *(6.25)* = 62.50	

The numbers in brackets indicate percentages of students who did not give comments, but either agreed or disagreed with the statements. In the case of the Perry 'B' column, it is the percentage of students who did not even indicate whether they agreed or not. It is then assumed that the students were uncertain of their feelings about the statement, and they were therefore given a Perry 'B' status.

These results will be compared with the GU results in Table 6.5 in Chapter 6. The same rules for reading the Appendixes and Tables in Chapter 6 are applied to Appendixes 11 and 12 and to Table 7.6 in this chapter. A brief recapitulation of these is given below.

Recapitulation of the rules for reading both the Appendix and the Tables:

- Where a student gave two statements belonging to different Perry categories in one question, both categories are written in the Appendix, with the stronger one highlighted in bold. It is this stronger category that is used in Table 7.6.
- Where a student gives more than one statement belonging to a single Perry category in one question, the statements are appropriately split up in the Appendix. This is borne in mind in Table 7.6, to make sure the total proportions of students in the three Perry categories do not exceed 100% for each question.

Question 1

> **Students Question:** Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.
> **Staff Question:** In tests and exams a good grade should reflect nothing but the students' ability to process in an effective way what was taught in class.

Comparison of University distributions

The distributions of the two universities showed prevalence of Perry 'C' thinking. In general, the UB students recorded higher Perry 'C' proportions and lower proportions of both Perry 'A' and 'B' statements than their GU counterparts. These results support Part 1 results. The results of the two universities can therefore be said to be qualitatively similar but quantitatively different. Appendixes 7a and 12a showed that the most popular statements were similar in the two universities, except the UB groups gave these in higher proportions. It appears that this was the main reason why the two were different. These Perry 'C' statements were, according to decreasing order of popularity:

- Further independent reading/research/broad thinking needed to broaden one's knowledge beyond what the lecturer gives, improve understanding, or for the students' own good.
- Understanding, interpretation, critical analysis, application, etc. need to be demonstrated and assessed.
- Lecturers do, and should only give skeletal information in class, students need to beef it up.

In GU, the Level 3 group seemed to have had problems with the issue in this question as they registered an extremely high Perry 'B' proportion of over 50% (see Table 6.5 in Chapter 6), which was much higher than the Perry 'C' proportion. This was not the case with the UB Year 3 group as they registered a Perry 'C' proportion (above 60%) higher than a Perry 'B' one (less than 20%), according to Table 7.6. It was however, peculiar to notice that within UB, the 3rd Year group had the highest Perry 'B' and lowest Perry 'C' proportions, as was the case with GU Level 3. This gives the impression that 3rd Year students in general find it comforting to have to rely to a higher extent, on lecturers' information to pass their exams. This was supported by the finding that in both groups, the 3rd Year students recorded the lowest proportions for the statement:

- Lecturers do, and should only give skeletal information in class, students need to beef it up.

The problem of Perry 'B' thinking observed at third year in the two universities implies that what happens during the course of second year in general confuses the students, as suggested before. The GU Level 3 group was found to have recorded a higher Perry 'B' proportion because of a number of statements they gave to the effect that students should be able to pass well with information from lectures, but would need to do more to excel. It was observed that no UB students gave such statements, and that would probably explain why their Perry 'B' proportion was much lower. One could conclude that the GU Level 3 group might have realised from experience that they managed to pass without doing extra work, otherwise one would wonder why such statements were popular with this group.

Misinterpretation of Question 1

Tables 6.5 and 7.6 indicate that there were fewer cases of the question being misconstrued at UB than there were at GU. Only the UB Year 3 group had one student who stated that they:

- Do not need lectures only, practical work necessary to do as well.

This student might have thought that 'information from lecturers' referred to that from lecture sessions only. Even though very low proportions of students in both universities misconstrued the question, it is worth re-wording it. An alternative question is given below, as it was not offered in Chapter 6:

- Students should be able to get a good grade by just absorbing the information they get from their lecturers in lecture sessions, labs, etc. and giving it back in tests and exams.

Transitional Stages

Appendixes 7a and 12a show that there were not as many students at UB in transitional stages (A/B & B/C) as there were at GU. This might explain the finding in Part 1, where more UB students seemed to go for extreme options while the GU students mildly agreed with the statements. This might indicate that UB students had progressed a little further than GU students in the developmental scheme.

Comparison of GU staff and students

Table 6.5 shows that the staff distribution was not too different from those of students. The proportion of Perry 'A', 'B' and 'C' statements given were comparable. It was interesting to note that the GU Level 4 group recorded higher Perry 'C' and lower Perry 'A; and 'B' proportions than the staff. This finding could indicate that the staff might have been prepared to 'mollycoddle' the students, while the Level 4 group wanted to be challenged. A staff Perry 'B' proportion of 28.33%, well above the 25% cut-off point, served to support this. One could then assume that the perceptions of students in the lower groups might have been highly influenced by the staff perceptions. The staff would not necessarily need to inform students directly not to read further, but students see practice as reflecting expectations, as the statements below show:

- All or most of what one needs for exams and tests is said in lectures, this is what the system asks for, therefore one has to oblige.
- Usually not so much is required to pass, the basics are enough.

Some statements given by some of the staff also serve to support the assumption that the lower levels might have been influenced by what they saw as being expected of them:

- At L3 and L4 students should be expected to draw on ideas and information they have discovered themselves, but L1 and L2 this is less expected.
- In L1 and L2 only taught material should be assessed and good grades be awarded if it given. In L3 and L4 lecture material should give good marks, excelling requiring more.
- At L3 a good grade should be based on lectures only, while an excellent grade should require more. For L4 even a good grade should require more.
- There is a big difference between 'should' and what actually happens, especially at L1 we are very constrained by time and numbers, and it is easier to base most assessment on what has been taught. Assessment is based more on students' broader skills at higher levels.
- At L2, it is impractical to expect a lot of extra work outside the lecture course. However, in an ideal situation, I disagree.

The last two statements give an idea as to why staff prefer students not to do further work. Perhaps this would give too much work for the staff. It is not the students' ability to do work that the staff may doubt, instead they may not want to overwhelm themselves with too much work. While one could sympathise with the staff on this matter, one should also consider the effect this has on the students. Most of them come to university expecting things to be different from what is practised in schools, only to be treated like school pupils, and this obviously gives them the wrong impression.

Though the UB students were not compared with the staff group, it is worthwhile to stress this point by giving examples from their responses, to show how students read the actions of staff:

- This is what should be going on in schools, but they want that here as well, so one has to give them what they want.
- This is what we are told should be the case, but exams show differently.
- In theory, failure to expand on ideas does not show understanding.

What these statements illustrate is that students with Perry 'C' thinking can easily be led to regression and confusion by sending them these wrong and sometimes mixed signals. The potential danger in this is that if this continues, the students might even end up believing this is the way things should be, and totally give up any trace of Perry 'C' thinking in them. The staff should therefore be prepared to drive their students towards maturity by presenting them with challenges and giving them more scope for independent work, rather than being caught up in the fear of either failing the students, or creating excess work for themselves.

It was found that there were some members of staff who were not prepared to 'handle the students with kid gloves':

- There should even at L1 be some evidence of students' reading, this should increase as they progress to L2, L3 and L4.
- At any level at university education a student should show independent thinking, assessment of knowledge and dogmas independently, and should be reading around course material.
- Even at L2, there should be room for the students' own thought, and this should be essential at L3 and L4.
- This is higher education – this question shouldn't even be asked.

If this was the general feeling amongst all members of staff, students could be led to achieve greater things through independence.

Question 2

Students: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes.
Staff: Group-work is of limited educational value in the teaching of biology.

Comparison of university distributions

The distributions for the two universities were once again, skewed towards the Perry 'C' side. As in Q1, the GU students registered lower Perry 'C' and higher Perry 'A' and 'B' proportions than their UB counterparts. The UB students seemed to have more faith in their peers as sources of knowledge. There were not as many statements alluding to the uselessness of group-work in the UB group as there were in the GU group.

Most UB students come from secondary schools in rural areas with very limited resources. It is very common then for students to start working together at very early levels. While one might think that lack of resources could be a disadvantage, but it can also be seen as positive in this context as students are forced to learn to share and communicate with each other earlier in their educational life. Even at university level, group-work remains central to their learning as only one university caters for the whole country, and the resources of space and equipment still remain in shortage.

It was noted that once again Level 3 seemed to have lower Perry 'C' and higher Perry 'A' and 'B' proportions than the other groups.

Misinterpretation of the Question

It was observed that there were no cases of misinterpretation of the question in the UB group, whereas 10.64% of GU Level 1 students misinterpreted the question. This was an unexpected result as one would have thought that the second-language UB students would have a problem with the language than the GU students.

Comparison of GU students with staff

Question 2 produced a similar trend in the results as Q1. The staff distribution was not too different from the student distributions. In fact, the staff group was observed to give higher Perry 'B' proportions than all the groups, except the late Level 2 group. It was also observed to record a lower Perry 'C' proportion than the Level 4 group. This, once again, can be interpreted as meaning that the staff were not too comfortable with, or did not have a lot of faith in, the students' ability to work on their own. The following statements serve to support this:

- Our students are too stupid to gain benefit from group-work.
- When 'working' in groups students tend not to participate, and weaker ones slope off leaving the group exposed.
- Group-work usually results in a few individuals doing most of the work.

The fact that the Level 4 students showed more mature perceptions about working with their peers shows that this could be appreciated if practised. The lower level students could have been made to feel unenthusiastic about working together by seeing that not much emphasis was placed on this aspect of their learning.

In the same manner as children can detect how their parents feel about certain things, students can detect how staff feel about certain practices, and probably adopt these ways. The statements below show how some members of staff questioned the extent of benefit the students can get from group-work:

• The extent to which students can benefit from group-work, though limited, can be valuable. Students do have group-work, but it is unclear how much each student benefits from them.

• Group-work is a valuable part of teaching biology, but I do think it's limited and doesn't allow for multiplicity of ways in which different people learn. I have seen examples of the 'bully syndrome' which inhibits quite nervous people from learning effectively.

Discussing the possibility of students gaining from group-work on the basis of it being a possibly hostile forum for the 'nervous people' defeats or disregards the whole purpose of group-work. It is supposed to help students learn how to interact, work, and communicate with each other despite their varying characters. When they leave university there will be nobody there to protect the timid from the 'bullies'. This is not say that there should be disorder and students should be thrown into snake-pits, but they should be being trained in the skills of communication, which could only benefit them in the future. Some members of staff clearly agreed with this kind if thinking:

• Ability to work together is vital these days, it is an important skill, irrespective of whether it teaches anything.

• Group-work is important as teaches transferable skills and is a true reflection of the workplace.

• We are not just teaching to create scientists, but to develop more general skills (co-operation, negotiation).

• Students need to learn to work in teams and interact with each other in order to be successful in almost all careers and human activity.

• Group-work is important in fostering interpersonal skills (communication – listening and discussing).

The benefits of group-work are endless, and Appendix 12b gives a plethora of these.

Question 3

Students: Learning by seeing connections between ideas is more effective than memorising isolated facts.

This question was regarded as too 'trivial or obvious' to ask members of staff, therefore it was replaced with one with a totally different theme:

- Students should carry out the majority of their work on their own and learn how to explore all resources available to them without dependence of lectures.

There will therefore be no comparison, made between the staff and the students in this question. Their distributions will be discussed separately.

Comparison of university distributions

Table 6.5 and 7.6 show that the UB groups generally had lower Perry 'B' and Perry 'C' proportions for Q3 than their GU counterparts. This was the first time the GU group registered relatively larger Perry 'C' proportions than the UB groups. Since the Perry 'A' and 'B' proportions for UB groups were not extra-ordinarily high, the reason for the drop in Perry 'C' proportions may have been due to the high proportions of misinterpretations. Only the UB Year 2 group had a proportion less than 10% misconstruing the question, hence its much higher Perry 'C' proportion. All the students who misinterpreted the question said something to the effect that:

- What one sees sticks better in the mind than hearsay.

It is not understandable why the UB students should have written this statement in much higher proportions than the GU students, while they did not do so with the other questions. One could try and argue for the second-language issue, but this could be discounted by the fact that generally, these students did not have any problem with the others. It is difficult to understand why the word 'seeing' totally overshadowed 'connections between ideas' which came immediately after it. One could however speculate that this might have had something to do with the fact that most students come to UB from very under-resourced schools, where they did more theory than practical work. On getting to UB, they would then have appreciated practical work a lot and realised how much of a disadvantage they were in at schools. This can be expected to be brought to the forefront the moment they see 'Learning by seeing...'. That could explain why most parts of the statement could be overlooked.

As with the GU results, there were some statements which indicated that some students felt the system required them to engage in rote learning:

- Students forced to memorise by the way things are – required to do so by system.

This proves that students do not feel challenged enough and are just playing along to please the system, a character that Perry states is exhibited by some Perry 'C' (Position 4 on the intellectual and ethical development scheme) students. This means the students deliberately keep their developmental process on hold as they see they can achieve good marks by functioning at lower levels.

Discussion of Question 3 for staff

Statement: Students should carry out the majority of their work on their own, and learn how to explore all resources available to them without dependence on lecturers.

This question was aimed at finding out if staff agreed with independence of students. It was hoped that the inclusion of the word 'majority' would spell out the fact that 'total independence from staff' was not what was being advocated. The results however, show that the presence of the phrases 'on their own' and 'without dependence on lecturers' might have clouded the issue. Most of the statements showed that some of the staff thought the statement meant there should be no lectures at all:

- Students should do a lot of work on their own, but I feel this statement underestimates the importance of lectures.
- Lecturers are able to guide and advise students in ways that books/CDs/Web cannot.
- Lecturers (or the staff) need to point out the areas of study (usually the lecture topics covered) – students can't choose what topics to study on their own.
- Some direction is required. Biology is a complex and developing field and students often need initial guidance and redirection.

Some of the statements showed that some members of staff literally took 'on their own' to mean working solo without others:

- As above, 'two heads are better than one'.
- We should facilitate and enable and encourage them to talk to each other, etc.

Since the question turned out not to be measuring what it was intended to measure, it is going to be excluded in the next questionnaire. The intention of the whole exercise was to compare students' and staff's perceptions, so it will probably be better to include the question that was in the student questionnaire, though it was left out on the basis of it being too trivial for lecturers. It would then have to be rephrased to:

- Students would learn more effectively if they looked for connections between ideas than if they absorbed isolated facts.

Question 4

Students: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning.

This statement was also thought to be too obvious for the staff and so in the staff questionnaire, it was replaced with another one with a different theme. This means that for Q4, there will be no comparison between staff and students.

Comparison of university distributions

Though the GU distributions had lower Perry 'A' proportions than the UB ones, they had relatively higher Perry 'B' and lower Perry 'C' proportions, except for Level 1. This once again, places UB students at a higher level of maturity. The high Perry 'B' proportions for GU students might indicate that these students were unsure of being provided with only guidance and not more. A look at Appendix 7d and 12d would reveal that the GU students were mostly worried about the process of selection of relevant information in relation to what to look for, where to look for it, how much to look for, and how to do so, than UB students. A lot of statements to this effect dominated the GU Perry 'B' category, as the following examples show:

- Lecturers should guide students as to where they might best find information (books & references) and how best to use it.
- If lecturers were just to guide students, it would be difficult for students to know how much more to learn outside lecture notes.
- Lecturers should put set 'boundaries' of where the students' study time should be aimed. In recent exams I felt I knew 'too much' in one area and other questions I was totally unprepared for.
- They have to tell you what to learn, otherwise you either learn too much or too little, depending on sources used.
- The lecturer should supply technique and support.
- They should offer tips on how to learn things.

This kind of thinking, though not totally absent in the UB group, was not as common as it was in the GU group. It was noticed, however, that the two statements that carried this feeling in the UB group were the most popular among the UB Perry 'B' statements. Though this was obviously masked by the Perry 'C' thinking in UB students, it shows that the students in both universities needed to be given some kind of induction course at early university, to help them learn how to carry out independent work and research.

Discussion of Question 4 for staff

- Lecturers do not have the authority to disagree with accepted scientific knowledge, and should not confuse students with their views where they disagree with books or theories.

The responses given by staff to this statement were predominantly Perry 'C' in nature. Some of the statements were focused on qualifying that lecturers do have authority, as they are experts involved in research and production of scientific knowledge:

- Lecturers (or most of them) actually participate in producing scientific knowledge – should transmit this to students.
- With the majority of staff conducting research, or in touch with the current research literature they do have the authority.
- Some of our lecturers write the books. Textbooks cannot be up-to-date in all areas.
- Most of us are researchers as well as lecturers, and thus do have this authority. But it is important to present a balanced view, not just one viewpoint.

The last statement was the one which carried all the information that was sought by the question. The question was not solely aimed at finding out how much authority the staff thought they had, but to go beyond that to the issue of presentation of conflicting views. One could say the crux of the question lay on the issue of whether the lecturers should let students know if they agreed with what is currently held as a scientific consensus or not. This was meant to be a follow-up of Q4 of Part 1, which read:

- A good lecturer is one who points out to students which is the one accepted view of an issue **Vs.** I think a good lecturer should give all views on an issue and give students a chance to evaluate them.

The results to the above question (see Table 7.1d(i) and Figure 7,1d(ii)) show that the staff only agreed mildly with the Perry 'C' component of this question. This leaves one wondering what it is in the question that made the agreement to be not as strong as with the other questions. It was hoped that Q4 Part 2 would provide some insight into this, but most of the responses focused on emphasising the 'unstable' and fallible nature of scientific knowledge, and that lecturers were expert enough to disagree with it if need be. There were some statements however, that indicated that lecturers expected the students to look critically at this knowledge.

- I'm wary of lecturers presenting ONLY their views. In controversial areas presentation of views is important – students should then get on with making up their own minds.
- I am very aware of subjecting my students to my own personal views, however, it is important for them to develop ability to look critically at all issues, even where there is accepted dogma.
- There is certainly a risk that lecturers promote personal views but as long as orthodox views are also made known to the students, this should be left to the students' judgement.

The nature of the responses given to this question indicate that it was actually investigating two issues, that of lecturers' authority to question 'accepted' knowledge, and that of presentation of their own views. This led to the realisation that in the next questionnaire, this will have to be split appropriately, and included in both the student and the staff questionnaires. These issues are essential in understanding the varied aspects of the expectations of both staff and students. Given below are proposed statements for the next questionnaire:

- Lecturers do not have the authority or right to disagree with accepted scientific knowledge.

• Lecturers should not confuse students with their views where they disagree with theories used in books students use in their courses, especially the textbooks.

Question 5

Students: Examinations should be confined only to what was taught.
Staff: The nature of biological knowledge makes it difficult to assess students using open-ended questions.

Though the two questions are both based on assessment issues, the students' question was on exam content, while the staff's was on exam format. For this reason, the results from these two groups cannot be compared. However, these will be compared with the results from similar questions.

Comparison of student distributions

There was a great distinction between the GU and UB distributions. Perry 'B' thinking was dominant among the GU students while UB students exhibited a stronger Perry 'A' thinking. Perry 'A' thinking was the least common in the GU groups while in the UB groups, the least common was Perry 'C' thinking. There was no doubt that GU students were more advanced than their UB counterparts when it came to issues relating to exam content. The GU students might have indicated that they were not too sure about what should be in their exams by registering higher Perry 'B' proportions, but they were clearly not as keen as UB students on having exams based on lectures only.

The most popular Perry 'A' statement recorded for the UB students, according to Appendix 12e, was to the effect that:

• One cannot, and shouldn't be tested on something they have not been taught or don't know (that would be unfair and/or shows ignorance)

This statement was classified as Perry 'A' statement on the basis of its indicating that the students wanted to rely only on what they had been taught. One could, however, argue that the students might have misinterpreted the question as implying that what was not in the syllabus could be included as well. If this was a case of misinterpretation then the outlook of the results would change, but the direction of changes cannot be predicted.

The results from Q10 in Part1 give an idea of whether there might or might not have been misinterpretation. The question read:

- In exams I prefer questions which are based on what the lecturer taught. Vs. In exams I prefer questions that demand thinking beyond what is taught in class.

Both the UB and GU distributions for this question were dominated by Perry 'A' thinking (see Figures 7.1j(i & ii). The UB students generally agreed strongly with the Perry 'A' statement, while the GU students only did so mildly (going for option 1 and 2 of the Perry 'A' category respectively). This finding indicates that there is a likelihood that the UB responses for Q5 Part 2 might have therefore represented the true feelings of the students, and not particularly misinterpretation of the question. One is only left to wonder why the UB students' perceptions took such a turn with this issue while they showed predominantly Perry 'C' thinking with other issues. This could however indicate the difference between idealised attitudes and reality.

The change in the GU distributions might have been a result of the change in the phraseology of the question. In Q10 Part 1, the students were asked what they preferred, but in this question, they were asked what should be the case. It would therefore be understandable if they showed uncertainty, as their preferences might have been in contradiction with what they know should be the case, hence the domination of Perry 'B' thinking.

Discussion of Question 5 for staff

- The nature of biological knowledge makes it difficult to assess students using open-ended question.

This question was aimed at investigating the issue of exam format further. The inclusion of the phrase 'the nature of biological knowledge' in the statement was meant to help expose any issues that might possibly lead staff into preferring short-answer questions. Though there were some members of staff who indicated that they did not understand what 'open-ended' questions were, the majority of the responses gave some useful insight into this issue. The responses were predominantly Perry 'C' in nature, with staff appreciating open-ended questions for their ability to assess students' understanding, promote students' own views, and to allow students to demonstrate their ability to handle information critically.

There were however, some members of staff who indicated that there were some reasons why they found using open-ended questions not desirable. Examples of such statements are given below:

- If you are wanting fairly to grade students, you should not use open-ended questions.
- It is usually preferable to set structured questions to avoid (minimise) answers which consist of fact-free generalisations.
- Answers that are right or wrong can be marked with 100% accuracy. Essays cannot.

Some statements, like those below, indicate that short-answer questions are preferred only for their convenience, as discussed before.

- I teach at L2. It is not the nature of biological knowledge that makes it difficult to assess students using open-ended questions, it is the large number of students that we have that makes it difficult.
- At higher levels this is true simply because there is so much in the literature. I am a physicist originally and was used to giving precise right or wrong answers – this is often not possible in biology.
- It is sometimes all too easy for students to write 'waffly' answers to this type of question. These answers are difficult to assess or rank.
- In exams in general due to constraints in marking time, etc, definite answer questions are more appropriate. However, in essays, providing the students justify what they write, open-ended topics are fine.
- Though I disagree, I would like to make the point that I am not always able to use the kind of questions I would like to because of departmental directives to cut down on marking (L2 especially).

This does not help much in the intellectual development of the students, as shown by the distributions in Figure 7.1(i). The students were found to have Perry 'B' thinking, as were the staff, when asked about exam format. If not given the proper practice, students would never be able to deal with these kinds of problems in real life.

Question 6

> **Students:** I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.
> **Staff:** Our courses are very successful in promoting growth in students through the years.

The two questions do not measure the same thing. The first was aimed at finding out how confident the students believed they were, while the second was aimed at finding out how much confidence the staff had on the effectiveness of their courses in promoting intellectual growth in students. Though the results cannot be compared directly, there are certain implications that can be drawn from the responses.

Comparison of university distributions

The GU Level 1 group could not be included in this comparison as they answered the question from the original version of the questionnaire while the others answered the one from the modified version. The distributions of the two universities were still found to have marked differences. For the two lower Levels in GU, early and late Level 2, the Perry 'B' proportions were much higher than Perry 'C' ones, and the opposite true for Levels 3 and 4 (See Tables 7.1f (i & ii)). With the UB groups however, Perry 'C' proportions were higher than Perry 'B' ones at all levels. This shows that the UB students were more advanced than their GU counterparts in this respect, i.e. they had more confidence in themselves.

This difference might indicate that the GU students were not introduced early enough in their courses to opportunities allowing them independence of thought. That might explain why they would have been unable to express their own views as freely as their UB counterparts. This assumption is supported by some of the staff's responses to the other questions, especially Question 4 in Part 2, where they indicated that lower levels needed to depend more on staff than upper levels.

The type of assessment these students are exposed to could have also contributed to their inexperience in expressing themselves. The staff stated that open-ended or essay-type questions were impossible to handle because of large classes, especially at lower levels. If the students are not even given the opportunity to give their views on paper, chances are they would find it even more difficult to do so when facing others. This shows that solutions to this problem have to be devised. The marking of all forms of assessment, not just lab reports, could even be shared between the lecturers and other members of staff like tutors, to make sure that the students are not the ones who end up losing out. Care must be taken however, to avoid situations where the students end up thinking that the lecturers are not interested in their work. Biggs (1999) suggests that when tutors mark assignments, lecturers should make sure they read samples, and discuss in class, and that they should let students know they are not delegating entirely.

Exposing students to Multiplicity at early levels of their courses would also ensure they get to know that their input is needed for critically assessing issues presented. This should however, be done gradually to avoid possible 'shock'.

Discussion of Question 6 for staff

- Our courses are very successful in promoting growth in students through the years.

Most of the statements given here further supported some of the assumptions made earlier. There were some statements, for instance, that corroborated the assumption that students might not have been challenged, especially at lower levels. These statements indicated that the staff acknowledged that they were aware of the fact they did not challenge the students, and students were almost deliberately short-changed:

- Too much emphasis on rote-learning.
- A lot of the 1st Year, especially the first term, is memory. Terms 2 and 3 much more challenging.
- Agreement does not imply that we can't do better! I think we rely too heavily on exams of factual information. But biology is a language as well as a science, and to discourse adequately, some basic learning is required.
- Excessive assessment at L2, especially fact-based MCQs, encourages a view of biological expertise as an exam technique, not a transferable skill. Little encouragement from system to change objectives.
- We rarely train and test students in their ability to think for themselves – regurgitation is all that is required for many courses.
- In L3 and L4 – I agree with this. In Levels 1 and 2, except in medicine PBL, we do not help students to explore, we feed them facts.
- L1 and L2 do not promote intellectual growth enough – L3 is a bit of a shock to students.

• We give a lot of emphasis to recalling facts in exams.

One would expect that if this is a common feeling among many members of staff, implementing reform or change to the system should be easier. The staff are perfectly aware that the students are being put at a disadvantage, and this should provide the impetus for their call for change.

There were other statements that might help explain the 'sophomore slump' discussed in Chapter 6. It has become apparent, so far, that staff were aware that they did not challenge the lower levels enough, but some even indicated this problem was more pronounced at Level 2:

• Some more than others. 2nd Year modules are generally less challenging than other levels.
• Too much 'spoon-feeding' particularly in Level 2. Some areas better in Level 3/4 and good innovation in Level 1 (self-study project).

It is not understandable why students should be exposed to fewer challenges at Level 2 compared to other levels. However, it is clear that staff know this, and hopefully a move towards changing the status quo would be made for the sake of the students. The finger of blame was once again pointed towards class sizes, as the statements below indicate:

• Class sizes are too large for good interactive teaching and assessment.
• They are becoming less successful than a few years ago. Reasons: Class sizes, teaching economies.
• Yes, one does feel intellectual growth as students progress through their 3rd and 4th Years (in earlier years, one tends not to know them personally). But the decline in small group teaching because of increased numbers makes this more difficult to achieve.
• There are too many students, especially poor ones, to allow the kind of individual attention which develops minds. Only one degree course in IBLS that provides small group tutorials (Pharmacology).

These responses stress the effect class sizes have on the whole teaching and learning process. This is a real problem that cannot be ignored. It is true that there is demand for further training in the form of higher education all over the world, but what good is this if in the end it does not achieve what it purports to achieve. It looks like the point of making higher education accessible to all, ends up overriding the purpose of higher education. Large classes are obviously making it impossible to produce students who will fit well in life after university. The following points on how to enrich large-class teaching have been extracted from Biggs' (1999) discussion:

- Interpose changes of activity during the lecture to keep students continually and fully attentive.
- Introduce breaks during the teaching to give students opportunity to monitor their notes and do some high-level cognitive work with what they have heard.
- Make sure there is a review activity at the end of the session, preferably by students.
- Have good management skills in the form of preparation, introduction, delivery and structuring of the lecture.
- Remove the feeling of impersonality that is characteristic of most large classes, by interacting with the students and making their presence acknowledged as much as possible.
- Make the sessions as active as possible by involving the students and using the appropriate teaching aids. Questioning should be allowed but care must be taken to make sure it does not throw the whole session off-course, and that one student's question is made to be a whole class's issue for discussion.
- Make an effort to make the students interact among themselves with good control of the situation. This interaction could be in the form of peer teaching.

These issues will be discussed in more detail in the concluding chapter.

7.3.4 Direction of intellectual growth at GU and UB based on Part 2 results

From the rank-orders of the Perry categories discussed in Chapter 6, it was concluded that the possible rank-order of intellectual maturity in GU students from both Part 1 and Part 2 could be:

Level 4 > Level 3> Early Level 2 > Level 1 > Late Level 2

The probable Part 1 rank-order for the advancement in intellectual maturity of UB students was assumed to be:

> Year 4 > Year 3 > Year 2 > Year 1 (with Year 4 being the most advanced and Year 1 the least so.

An estimate of the possible rank-order for the development of UB students is also determined for Part 2, and this will be compared to the one above. The same procedure for determining the position of each level in the rank as employed in the previous discussion will be used here. For each question, a level is given a position depending on the proportion of Perry 'A', 'B', and 'C' produced. High Perry 'A' and 'B' proportion result in the level being placed towards the end of the rank, while high Perry 'C' proportion place the level at the beginning of the rank.

Perry 'A' rank-orders for UB Part 2

Q1: Year 4 (10.42%) < Year 3 (18.31%) < Year 2 (19.87%) < Year 1 (25.85%)
Q2: Year 1 (2.44%) < Year 2 (2.65%) < Year 4 (4.17%) < Year 3 (5.65%)
Q3: Year 2 (0.66%) < Year 3 (1.41%) < Year 1 (2.44%) < Year 4 (4.17%)
Q4: Year 4 (6.25%) < Year 3 (8.45%) < Year 2 (13.91%) < Year 1 (16.12%)
Q5: Year 1 (38.54%) < Year 2 (40.39%) < Year 3 (47.89%) < Year 4 (54.16%)
Q6: Year 4 (14.58%) < Year 1 (19.51%) < Year 3 (21.14%) < Year 2 (22.52%)

Perry 'B' rank-orders for UB Part 2

Q1: Year 2 (7.29%) < Year 1 (8.29%) < Year 4 (8.33%) < Year 3 (18.31%)
Q2: Year 1 (5.37%) < Year 2 (7.95%) < Year 4 (8.33%) < Year 3 (8.45%)
Q3: Year 4 (0.00%) < Year 2 (0.66%) < Year 1 (2.92%) < Year 3 (4.23%)
Q4: Year 2 (9.27%) < Year 1 (13.19%) < Year 4 (14.58%) < Year 3 (16.91%)
Q5: Year 1 (32.20%) < Year 3 (35.21%) < Year 2 (36.43%) < Year 4 (37.50%)
Q6: Year 4 (22.92%) Year 2 (29.80%) < Year 1 (35.61%) < Year 3 (38.03%)

Perry 'C' rank-orders for UB Part 2

Q1: Year 4 (81.25%) > Year 2 (72.85%) > Year 1 (65.85%) > Year 3 (61.97%)
Q2: Year 1 (92.19%) > Year 2 (89.40%) > Year 4 (87.50%) > Year 3 (85.92%)
Q3: Year 2 (93.38%) > Year 1 (83.90%) > Year 4 (81.25%) > Year 3 (74.65%)
Q4: Year 4 (79.16%) > Year 2 (76.82%) > Year 3 (74.65%) > Year 1 (70.72%)
Q5: Year 1 (29.27%) > Year 2 (23.18%) > Year 3 (16.90%) > Year 4 (8.33%)
Q6: Year 4 (62.50%) > Year 2 (47.70%) > Year 1 (44.88%) > Year 3 (40.89%)

The number of times each level appeared at any of the four positions in the ranks was recorded in Table 7.7 to give an idea of the frequency at which the levels assumed these different positions.

Table 7.7: The Number of times the Different UB Groups assumed the Different Positions in the Rank-orders for the Three Perry Categories in all the 6 Questions in Part 2 put together

	Position	In		Rank
Level of Study	**1**	**2**	**3**	**4**
Perry 'A'				
Year 1	2	1	1	2
Year 2	1	2	2	1
Year 3	0	3	2	1
Year 4	3	0	1	2
Perry 'B'				
Year 1	2	2	2	0
Year 2	2	3	1	0
Year 3	1	1	0	5
Year 4	2	0	3	1
Perry 'C'				
Year 1	2	1	2	1
Year 2	1	5	0	0
Year 3	0	0	2	4
Year 4	3	0	2	1

Because there were only 6 questions being analysed, it was anticipated that determining rank-orders would be difficult because of the high possibility of the levels recording similar number of questions at a similar position. The rank-orders determined from this analysis can therefore be seen as an estimation of the extent of advancement in intellectual thought determined more qualitatively than statistically/quantitatively.

In the rank-orders in the Perry 'A' category, Year 4 appeared more times than any other level in the first position, which suggests that it must have been the most advanced. Year 3 appeared more times than others in the second position, which could be taken to suggest it was the second most advanced. Year 3 was also found to dominate the third position, together with Year 2. But since Year 3 was also found at position 2 in three questions while Year 2 was found there only in two questions, Year 3 was assumed to be more advanced than Year 2, therefore Year 2 placed at position 3. Not only was Year 4 found at position 1, it was also found at position 4 with Year 1. Since year 1 was not found to dominate any other position but position 4, Year 1 was assumed to be at position 4, and not Year 4.

The Perry 'A' rank-order, in order of decreasing maturity, can therefore be estimated to be *Year 4 > Year 3 > Year 2 > Year 1* (with Year 4 being the most advanced and Year 1 the least so).

The Perry 'B' rank-order was not as easy to outline as the Perry 'A' one because of the extent of shared positions. Years 1, 2 and 4 all appeared twice in the first position. This makes it difficult to determine straight away which of these three levels can be said to be at this position. Year 3 is however, seen to clearly dominate position 4. This result agrees with the result from Part 1, where it was concluded that the 3rd Year students' had more Perry 'B' characteristics in them than the other groups. Position 3 as seen to be dominated by Year 4, while position 2 was dominated by Year 2. Since Year 2 and Year 4 were found to dominate other positions, they were therefore unlikely to dominate position 1, therefore Year 1 was assumed to qualify for position 1 more than these two levels. The estimated Perry 'B' rank-order was therefore *Year 2 > Year 1 > Year 4 > Year 3* (with Year 1 having the lowest and Year 3 the highest Perry 'B' proportions in general). This suggests that the lower levels might have been more confident than the upper levels, especially Year 3.

In the Perry 'C' category, Year 4 dominated position 1, while position two was dominated by Year 2. This places the two levels at position 2 and 3 respectively, in the rank-order. Year 1 and 3 both appeared twice at position 3, but since Year 1 had appearances at the positions 1 and 2, while Year 3 didn't, this suggested that Year 1 generally produced higher proportions of Perry 'C' thinkers than Year 3, putting them at position 3 and 4 respectively. This was backed-up by the dominance of Year 3 at position 4. The possible Perry 'C' rank-order was therefore estimated to be *Year 4 > Year 2 > Year 1 > Year 3.*

7.3.5 Conclusion

All the three rank-orders suggest that the Year 4 students were generally more advanced than the other levels. There is also an indication that Year 3 students exhibited Perry 'B' thinking more than the others. This shows that though progression to upper levels of intellectual thought does occur as students move from lower to upper levels of their courses, it does not necessarily do so smoothly and linearly, i.e. there are some obstacles that hinder growth at some points during the progress of the courses. The nature of the data, especially the limited number of questions used, makes it difficult to clearly assign positions in the rank-orders of student development, but at least an idea of which levels are most advanced and which are least so can be qualitatively determined.

CHAPTER EIGHT

DISCUSSION OF THE RESULTS OBTAINED FROM THE GROUP FOLLOWED FROM FIRST TO THIRD YEAR

8.1 Introduction

The results discussed so far have shown that students' perceptions change as they progress through their courses. Perry's scheme of ethical and intellectual development has proven to be quite useful in determining this progress, and detecting where, during their progress from year to year, the students tend to have more problems. Perry's scheme has been criticised on the basis that it would prove impossible to use for diagnostic purposes as it requires a lot of time to follow students from year to year. Wilson (1981) states that Perry's critics stress that few staff have the opportunity to assess, or the continuity of contact with First Year students which would be necessary for building up the personal picture which Perry regards as desirable.

The results discussed in the previous chapters have shown that this scheme is still useful for diagnostic purposes, without the need to follow a single group of students over several years. Comparing the different groups gives invaluable information as one can manage to detect which group shows more signs of experiencing problems in their courses than the others. This however, does not deny the fact that the scheme would have been more useful if a single group of students was followed throughout the three years of the project.

In this research, an attempt was made to follow a group of students from Level 1 to Level 3 to find out how their perceptions might have changed over the years. As Perry's critics claimed, this proved difficult, and only a group of nineteen students managed to fill in the questionnaire at all three levels. Another eighteen only managed to do so at 1^{st} and 3^{rd} Year. It was anticipated that the results from such a small group would probably not be representative of the whole group. On comparing the perceptions of the students at these three levels statistically, it would be possible, for instance, to declare that there are no significant differences when in fact there were. This effect, known as a Type II error in statistical terms, does occur by chance sometimes, but the smaller the sample size, the more likely it is to occur, according to a source on the Web (www.sportsci.org/resource/stats/errors.html). Instead of drawing distributions and rank-orders as was done in the previous chapters, the results from this group will be used to support certain assumptions and assertions made in the general discussion of all the results.

After identifying changes or stabilisations in the students' perceptions throughout the three years, the intention was to follow these up with interviews with the students. During the only two occasions when a handful of students agreed to a joint discussion for this purpose, the discussions could not be successfully recorded due to technical failure of the tape-recorders used. The tapes came out inaudible in most parts, leading to loss of most of the information. This was a huge setback on the research as it had been hoped that these interviews or discussions would provide valuable insight as to why students perceived things the way they did, or why there might or might not have been any changes in their perceptions.

The results from the two parts of the questionnaire will be treated separately as in the previous chapters. Section 8.2 will deal with Part 1 while Section 8.3 will deal with Part 2 of the questionnaire. Because of the high probability of a Type II error occurring the results will not be analysed statistically, but only qualitatively.

8.2 Part 1: Results and Discussion

All possible changes and stabilisations in the students' perceptions were mapped up on the basis of all the possible combinations of the positions they could choose on the questionnaire scale. The two positions within each of either Perry 'A' or 'C' categories were not combined since it was obvious that each of the two positions represented a different level in the commitment to the categories that the students agreed with, considering that in most cases they did not go for the extreme positions.

The stages of progression are divided into three: (i) progression from Level 1 to Level 2; (ii) progression from Level 2 to Level 3; and (iii) the overall progression from Level 1 to Level 3. The first two stages will be discussed on the basis of the results from the 19 students who managed to fill the questionnaire in at all three levels. The third will be based mainly on the results of these 19 students, with further clarifications based on the results of the 18 students who only managed to do so at 1st and 3rd Year.

When the comparisons are made between the different levels, the time of data collection has to be borne in mind. The data were collected at late Level 1 (March 1998), early Level 2 (November 1998), and early Level 3 (December 1999).

8.2.1 Progression from Level 1 to Level 2

The numbers and percentages of students who underwent the different changes in perceptions were recorded in Appendix 13. When a student chose one option on the questionnaire scale at Level 1 and then changed to another option at Level 2, it was assumed they had undergone a change in perception. The extent of the change depends on whether they changed options within a Perry category or changed to a different category altogether.

8.2.1.1 Popularity of Option 4 of the Perry 'C' category

The results indicate that many students started at and remained within the Perry 'C' category in most of the questions. The most popular option of the Perry 'C' options on the scale was option 4, which was opted for by high proportions of students at both Level 1 and Level 2 (compare '4-4: C-C' with other 'changes' in Appendix 13). This supports the finding made in the previous chapters, that option 4 was quite popular with GU students. It also indicates that at early Level 2, these students still agreed mildly with Perry 'C' statements the way they did at Level 1. One could be led to think that these students might have lacked the encouragement to develop stronger positive perceptions, in other words, the necessary challenges and support were not there to help them move to higher levels of commitment in Perry 'C' thinking. On the other hand, one could say that the time between late Level 1 and early Level 2 was not enough to allow for any changes in perceptions.

The results also showed that changes from other options to option 4 were more common than changes to option 5. This is evident in movements from options 2 and 3 to either 4 or 5. In each case, higher proportions of students moved to option 4 than to 5. This once again shows that students felt more comfortable agreeing mildly with the statements than doing so strongly.

8.2.1.2 Evidence of more stabilisation than growth, and more growth than regression

Appendix 13 shows that there seemed to be a lot more stabilisation, as shown by high proportions of students choosing similar options at both 1st and 2nd Year, than changes in perceptions. This, once again, was not surprising because of the timing of the data collection. The time period between late Level 1 and early Level 2 might not have been enough to result in changes in students' perceptions.

The results also indicate that there were more instances of growth as opposed to regression. In most of the questions higher percentages of students moving from lower to higher options on the scale, than there were those moving from higher to lower positions. This also did not come as a surprise since the results from Chapter 6 indicated that early Level 2 students had more mature perceptions than Level 1 students in most cases. The most popular positive changes were from option 3 (Perry 'B') to 4 (Perry 'C'), followed by that from option 4 to 5 (Perry 'C').

Regressions to Perry 'A' were uncommon between late Level 1 and early Level 2, according to Appendix 13. There were low proportions of students moving from Perry 'C' to 'A' and from Perry 'B' to 'A'. The results in Appendix 13 were summarised in Table 8.1 to determine the directions and magnitudes of the observed changes.

It has to be noted that though a movement from a Perry 'A' to a Perry 'B' position might indicate that a student has 'risen to uncertainty', it still indicates that they have grown to realise that things are not as 'black or white' as they might have thought previously. This is therefore regarded as a positive move, or in Perry's terms, a sign of intellectual growth. $\sum (0)$ stands for the total number of students who did not have any change in perceptions or chose the same option in the two years, or the sum of stabilisations. $\sum (+)$ and $\sum (-)$ stand for the total number of students who moved to upper and lower levels of perception respectively. The proportions are given in brackets.

Table 8.1: Frequencies and Percentages (in brackets) of Students who experienced the Different Directions and Magnitudes of Changes in Perceptions between Level 1 to Level 2

Δ	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
+4	-	-	-	-	-	-	1 (5.26)	-	-	-	-
+3	-	-	-	-	-	-	1 (5.26)	-	-	-	-
+2	2 (10.5)	1 (5.26)	1 (5.26)	-	1 (5.26)	1 (5.26)	**5 (26.3)**	1 (5.26)	1 (5.26)	1 (5.26)	-
+1	4 (21.1)	**7 (36.8)**	**5 (26.3)**	3 (15.8)	4 (21.1)	3 (15.8)	4 (21.1)	3 (15.8)	**6 (31.6)**	2 (10.5)	**5 (26.3)**
Σ(0)	**7 (36.8)**	**7 (36.8)**	**9 (47.4)**	**10(52.6**	**9 (47.4)**	**7 (36.8)**	**5 (26.3)**	**11(57.9**	**5 (26.3)**	**7 (36.8)**	**6 (31.6)**
-1	3 (15.8)	2 (10.5)	-	4 (21.1)	3 (15.8)	**5 (26.3)**	1 (5.26)	2 (10.5)	4 (21.1)	**7 (36.8)**	**5 (26.3)**
-2	1 (5.26)	-	2 (10.5)	-	-	1 (5.26)	-	-	1 (5.26)	-	-
-3	-	-	-	-	-	-	-	-	-	-	1 (5.26)
-4	-	-	-	-	-	-	-	-	-	-	-
Σ(+)	**6 (31.6)**	**8 (42.1)**	**6 (31.6)**	3 (15.8)	**5 (26.3)**	4 (21.1)	**11(57.9**	4 (21.1)	**7 (36.8)**	3 (15.8)	**5 (26.3)**
Σ(-)	4 (21.1)	2 (10.5)	2 (10.5)	4 (21.1)	3 (15.8)	**6 (31.6)**	1 (5.26)	2 (10.5)	5 (26.3)	**7 (36.8)**	**6 (31.6)**

The table above was constructed to give a general idea of how the directions of change (-ve or +ve) compared. The table clearly shows that indeed stabilisation was more common than both the positive and the negative changes. In 8 out of 11 questions, the sum of stabilisations was greater than that for positive changes. It has to be noted however, that the high proportions of stabilisation must have been influenced by the presence of the '5-5: C-C' category, which was fairly popular. This category cannot be regarded in the same light as the others, because it does not have negative implication of students staying in one position and not progressing, as it is the highest option on the scale.

In 7 out of 11 questions, the sum of positive changes (Σ(+)) was greater than that of negative changes. This implies that in general, there were more cases of progression than those of regression in the students' perceptions as they moved from 1st to 2nd year.

8.2.1.3 Stabilisation in and regression to the Perry 'A' Category

Appendix 13 shows that stabilisation in and regression to the Perry 'A' category were more common in Q10 than in any other question. A relatively high proportion of 31.6% for '2-2: A-A' was recorded for this question, while the other questions either recorded nothing or proportions as low as 5.26%. This observation was in line with the previous finding that students generally operated at Perry 'A' in regard to this question, which dealt with exam content. Though one would have hoped that this attitude would have finished by the end of 1st year, it has to be remembered that both students and staff offered statements to the effect that 1st year exams were mainly based on lecture material. The students' perceptions could therefore not have possibly changed during the process of 1st Year, given this lack of challenges. The timing of data collection at early Level 2 also means that not much chance was given for the students to undergo any changes if the 2nd Year syllabus was able to do that.

High proportions of regression were also recorded for Q10 (31.6% (sum of '2-1: A-A' and '3-2: B-A'). The question with the second-highest proportion of regression cases (15.8% between '3-2: B-A' and '3-1: B-A') was Q9, which dealt with exam structure. Nothing was recorded in these categories for other questions. This could be taken to imply that the students who might have been uncertain about the content of exams at 1st Year might have had it confirmed to them through what was practised during the year, that exams were based only on lectures. This would explain the move from a Perry 'B' position of uncertainty to a Perry 'A' one, that of confidence in the system. This finding also stresses the fact that students read the lecturers' practice as the norm, and possibly the rule, and act on it to ensure their own success.

8.2.2 Progression from Level 2 to Level 3

As in 8.21 above, the changes in the students' perceptions between Level 2 and Level 3 were determined and recorded. The results are shown in Appendix 14. When a student chose one option on the questionnaire scale at Level 2 and then changed to another option at Level 3, it was assumed they had undergone a change in perception. The extent of the change depends on whether they changed options within a Perry category or changed to a different category altogether.

8.2.2.1 Popularity of Option 4 of the Perry 'C' category

The results in Appendix 14 show that the Perry 'C' category was still dominant than others. It was also evident that option 4 was more popular than option 5 at 3rd Year. One would have thought that progression from 2nd to 3rd Year would result in more students changing from option 4 to 5 in most of the questions as their university experience increased. It was however observed that higher proportions of students chose option 4 at both 2nd and 3rd Year than those who did so at 1st and 2nd Year. These increased option 4 perceptions could be attributed to the fact that most students had actually chosen option 4 at 2nd year. One would therefore expect them to be there if they had not either regressed to lower levels or developed stronger perceptions of option 5. This means that option 5 still remained less popular than option 4. Since option 4 could be equated to the lowest level of Perry 'C' thinking, one could be made to believe, once again, that there were not enough challenges and support to promote student growth to upper levels of commitment.

8.2.2.2 Evidence of more stabilisation than change and more regression than growth between 2nd and 3rd Year

Appendix 14 seems to show that there were more cases of students choosing the same option in both 2nd and 3rd Year, than those changes to higher or lower options. The directions and magnitudes of changes were determined and the results were recorded in Table 8.2 below:

Table 8.2: Frequencies and Percentages (in brackets) of Students who experienced the Different Directions and Magnitudes of Changes in Perceptions between Level 2 and Level 3

Δ	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
+4	-	-	-	-	-	-	-	-	-	-	-
+3	-	-	-	-	-	-	-	-	-	-	-
+2	-	1 (5.26)	2 (10.5)	-	-	1 (5.26)	-	2 (10.5)	1 (5.26)	-	2 (10.5)
+1	**7 (36.8)**	3 (15.8)	3 (15.8)	3 (15.8)	-	**5 (26.3)**	1 (5.26)	1 (5.26)	3 (15.8)	3 (15.8)	1 (5.26)
Σ(0)	**8 (42.1)**	**9 (47.4)**	**7 (36.8)**	**12(63.2**	**10(52.6**	**7 (36.8)**	**13(68.4**	**9 (47.4)**	**12(63.2**	**7 (36.8)**	**11(57.9**
-1	3 (15.8)	**5 (26.3)**	**6 (31.6)**	3 (15.8)	**6 (31.6)**	3 (15.8)	4 (21.1)	**6 (31.6)**	2 (10.5)	**7 (36.8)**	4 (21.1)
-2	-	-	-	-	1 (5.26)	2 (10.5)	-	-	-	1 (5.26)	-
-3	-	-	-	-	-	-	-	-	-	-	-
-4	-	-	-	-	-	-	-	-	-	-	-
Σ(+)	**7 (36.8)**	4 (21.1)	**5 (26.3)**	3 (15.8)	-	4 (21.1)	1 (5.26)	3 (15.8)	4 (21.1)	3 (15.8)	2 (10.5)
Σ(-)	3 (15.8)	**5 (26.3)**	**6 (31.6)**	3 (15.8)	**7 (36.8)**	**5 (26.3)**	4 (21.1)	**6 (31.6)**	2 (10.5)	**8 (42.1)**	4 (21.1)

Table 8.2 shows that the 'growth patterns' between Level 2 and Level 3 differ a lot from those observed between Level 1 and Level 2. In both cases, stabilisation seemed more common than changes in perceptions, but as explained earlier, this might have been influenced a lot by students opting for position 5 on the scale in two consecutive years. Unlike between Level 1 and Level 2, there was evidence of more regression than progress between Level 2 and Level 3. In 9 out of 11 questions, the sum of negative changes (Σ(-): regression) was higher than

that of positive changes ($\sum(+)$: progress). This finding indicates that the students might have had some difficulties during the course of their 2nd Year that resulted in their perceptions being negatively influenced. It is not surprising therefore, to find evidence of this at early Level 3, before the students had more experience of the 3rd Year course. This supports the 'sophomore slump' phenomenon discussed in earlier chapters. In earlier chapters it was revealed that staff admitted presenting low levels of challenges to 2nd Year students, which does not encourage intellectual growth.

When the results from Appendices 13 and 14 are compared, it can be seen that there was an increase in the proportion of students regressing from option 5 to option 4. Even though this is movement within the Perry 'C' category, it is still a negative change in perception as the students show signs of being less committed to their agreement with the statements. It was also observed that the most notable regression after that from option 5 to 4 in Appendix 14 was that from option 4 to 3. This means that these students' 2nd Year experience had the effect of making them more uncertain in what the course expected of them. As discussed in previous chapters, this might have been the result of confusion in multiplicity, and mixed signals from the staff.

It was observed that progression from option 3 to 4 or 5 were not as common as they were between Level 1 and 2. This was understandable because a lot of movement in these directions had already occurred between Level 1 and 2. In that case, there would be fewer students at the initial position of option 3 at 2nd Year than there were at 1st Year as most would have already chosen either option 4 or 5 at 2nd Year. At the end of the day, the results have come to confirm that 2nd Year students had more problems than other levels.

8.2.2.3 Stabilisation within the Perry 'A' category

As in progression from Level 1 to Level 2, Question 10 was still found to produce more students who stabilised at option 2 of the Perry 'A' category than other questions. The proportion of students who stabilised within option 2 was found to remain at 31.6%, as it was between Level 1 and Level 2. This means that these students had not yet felt or met anything in their courses that could help change their perceptions positively. This could, once again be attributed to the lack of challenges declared by staff.

8.2.3 Overall progression from Level 1 to Level 3

This discussion will mainly be based on the results from the 19 students who filled the questionnaire at all three levels, but the results of those who did so only at Level 1 and Level 3 will be used to confirm any trends, if need be. The proportions of students choosing the different options at Level 1 and 3 are recorded in Appendix 15.

8.2.3.1 Stabilisation at Option 4 of the Perry 'C' category

The results in Appendix 15 indicate that a lot of students chose option 4 at both Level 1 and Level 3. The proportions of students who did this were however lower than those of students who chose option 4 at Level 2 and Level 3. This obviously means that some students moved to option 4 from other options between Level 1 and Level 2, and then did not change their options at Level 3. This is confirmed by the finding that in Appendix 14 (L2 to L3), there were generally more cases of stabilisation at option 4 than movement from option 4 to other options.

8.2.3.2 Evidence of more stabilisation than growth and more growth than regression

Table 8.3: Frequencies and Percentages (in brackets) of Students who experienced the Different Directions and Magnitudes of Overall Changes in Perceptions between Level 1 to Level 3

Δ	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
+4	-	-	-	-	-	-	-	-	-	-	-
+3	1 (5.26)	-	-	-	-	-	3 (15.8)	-	-	-	-
+2	1 (5.26)	1 (5.26)	3 (15.8)	-	-	-	3 (15.8)	2 (10.5)	2 (10.5)	-	1 (5.26)
+1	4 (21.1)	**6 (31.6)**	**5 (26.3)**	3 (15.8)	1 (5.26)	4 (21.1)	**6 (31.6)**	2 (10.5)	**5 (26.3)**	2 (10.5)	3 (15.8)
Σ(0)	**9 (47.4)**	**10(52.6**	**8 (42.1)**	**10(52.6**	**12(63.2**	**10(52.6**	**5 (26.3)**	**8 (42.1)**	**7 (36.8)**	**10(52.6**	**8 (42.1)**
-1	3 (15.8)	1 (5.26)	4 (21.1)	4 (21.1)	4 (21.1)	3 (15.8)	1 (5.26)	**6 (31.6)**	4 (21.1)	**6 (31.6)**	**5 (26.3)**
-2	-	-	-	1 (5.26)	1 (5.26)	1 (5.26)	-	-	-	-	1 (5.26)
-3	-	-	-	-	-	-	-	-	-	-	-
-4	-	-	-	-	-	-	-	-	-	-	-
Σ(+)	**6 (31.6)**	**7 (36.8)**	6 (31.6)	3 (15.8)	1 (5.26)	4 (21.1)	**12(63.2**	4 (21.1)	**7 (36.8)**	2 (10.5)	4 (21.1)
Σ(-)	3 (15.8)	1 (5.26)	4 (21.1)	**5 (26.3)**	**5 (26.3)**	4 (21.1)	1 (5.26)	**6 (31.6)**	4 (21.1)	**6 (31.6)**	**6 (31.6)**

Table 8.3 shows that most students did not change their perceptions between Level 1 and

Level 3. What has become apparent though is that this does not necessarily mean that students chose the same option at all three levels. In general, there were some changes that occurred during the course of Level 2, but most of the students reverted to the perceptions they held at Level 1 at early Level 3. However, the results show that overall, stabilisation ($\Sigma(0)$) was more common than changes in perceptions between Level 1 and Level 3.

Comparison of Tables 8.1 and 8.2 shows that between Level 1 and Level 2 there were more cases of positive changes than regression, while between Level 2 and Level 3 there was more regression than positive changes. One would therefore expect that the overall change in students' perceptions between Level 1 and Level 3 be almost non-existent. The finding that Table 8.3 bears more instances where the highest proportions for lack of changes ($\Sigma(0)$) are recorded compared to Tables 8.1 and 8.2 supports this.

8.2.4 Confirmation of more stabilisation than growth and more growth than regression between Level 1 and Level 3

Putting the results of the students who filled in the questionnaire at all three levels together with those of students who did so only at Levels 1 and 3 gives the following results:

Table 8.4: Summary of Frequencies of Students Who Underwent either Positive or Negative Changes or Stabilisation in Perceptions between Levels 1 and 3 (all 37 students)

Change	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
0	18	18	18	17	24	20	7	17	14	15	16
+	11	15	10	11	4	10	23	10	12	5	5
-	7	3	8	8	8	6	6	9	10	16	15

Table 8.4 is a frequency table that shows how many students underwent the different changes in perceptions. A (+) denotes moving from one position on the questionnaire scale to a higher position (growth), a (-) regression to a lower position, and (0) signifies no change, hence stabilisation. For some questions, the frequencies do not add up to 37 because there were some students who did not chose any position on the scale.

The results evidently show that overall, there were more cases of stabilisation than those of changes in students' perceptions between Level 1 and the time of data collection at Level 3. It is also clear that there was generally more growth than regression, except in Questions 5, 10 and 11, where the opposite was true. Question 10 dealt with exam content, and it would appear that as students progressed to Level 3, the felt less strongly for the issue of exams being based on material outwith lectures.

Question 5 dealt with challenges presented in the form of difficult topics. The results indicate that the students felt more unwilling to face challenges as they progressed from Level 1 to Level 3. This might, as discussed before, indicate that students come into Level 1 expecting to be challenged, only to be molly-coddled and made to believe that challenges are not necessary. They might have also felt overwhelmed by the demands of university education. From the statements provided by both the staff and the students, however, it can be concluded that the first explanation is more likely to be the case than the latter. There were statements to the effect that lower level students, especially 2nd Year students, were not challenged enough.

Question 11 dealt with quality against quantity in exams. The students seemed to have moved from believing in providing and being rewarded for quality in exams towards believing that they should be rewarded for giving as much information as possible. One could again argue that the students might have learnt from their experience at university that what they might have expected to see happen before they came to university was all idealism, which did not take place in reality. This further stresses the assumption that students model their actions against what is practiced by the staff.

8.2.5 Evidence of more growth than stabilisation for Question 7

Table 8.4 shows that Question 7 was the only question in which there were more cases of growth than stabilisation. This seems to have been the case even between Level 1 and Level 2 (Table 8.1). Between Levels 2 and 3 however, stabilisation dominated changes (Table 8.2). When only the 19 students who filled in the questionnaire at all levels are looked at (Table 8.3) there is indeed an overall domination of growth over stabilisation. This question dealt with students' approaches to learning biological knowledge. The results indicate that during the period between late Level 1 and early Level 2, the students learnt very well that they were not supposed to memorise and regurgitate information, but to look for connections between different pieces of information.

There was evidence of more progress between late Level 1 and early Level 2(Table 8.1), than between early Level 2 and late Level 3 (Table 8.2) for Question 7. There were obviously not enough challenges to prompt this growth during the course of the 2nd Year. This further stresses the ineffectiveness of the 2nd Year course at promoting intellectual growth in students.

8.3 Part Two: Results and Discussion

In this section, the results from the six questions are not treated individually. The statements were categorised according to the Perry positions as which they qualified. The movements of the students between the Perry categories during their progress from Level 1 to Level 2, Level 2 to Level 3, and the overall movement from Level 1 to Level 3 were then determined. The results were recorded in Appendices 16, 17 and 18.

8.3.1 Progression from Level 1 to Level 2

When looking at progression from Level 1 to Level 2, only the first five questions in Part 2 can be considered since after Level 1 results were analysed, Question 6 had to be replaced with a different question. The Question 6 answered at Level 1 was therefore different from that answered at Levels 2 and 3.

The results in Section 8.2.1 (Part 1 results) showed that the Perry 'C' category was popular at both Level 1 and Level 2. Appendix 16 confirms this finding. The students were found to have stabilised at Perry 'C' in higher proportions than they were found to make any other change in perceptions. This stabilisation at Perry 'C' was found to be common in all questions with all the aspects of students' learning investigated, except the exam content issue. Appendix 13 (Q10) and Appendix 16 (Q5) show this. This was because in these questions there were very low proportions of students exhibiting Perry 'C' thinking.
To find out if there might have been more cases of stabilisation than growth, and more growth

than regression as Part 1 results had shown, a summary of the directions of changes in perceptions was made, and the results recorded in Table 8.5.

Table 8.5: Summary of Proportions of Students Undergoing the Different Changes in Perceptions Between Level 1 and Level 2 (Part 2)

Change	Question 1	Question 2	Question 3	Question 4	Question 5
0	9 (47.7)	8 (42.1)	14 (73.7)	9 (47.7)	5 (26.3)
+	5 (26.3)	4 (21.1)	2 (10.5)	4 (21.1)	5 (26.3)
-	5 (26.3)	3 (15.8)	3 (15.8)	6 (31.6)	7 (36.8)

Table 8.5 confirms that there were more cases of stabilisation in students' perceptions between Levels 1 and 2 than there were any changes. However, the results also show that in 3 out of the five questions, there were more cases of regression (-) than progression to upper levels of intellectual thought (+), and only 1 question in which there were more cases of growth than regression. This means that there was generally more regression than growth. This was found to be contradictory to the results of Part 1. This shows that when students are asked to write their own opinions they tend to express themselves 'possibly more honestly' than they do if asked to pick statements that are already written down for them, as was the case in Part 1.

In Questions 4 and 5, these regressions occurred in over 25% of the students. Most of the cases of regression were from Perry 'C' to Perry 'B' (Appendix 16). This implies that after going through Level 1, the students regressed to feeling uncertain of how much they should rely on their lecturers, and to what extent the exams should be based on lectures. This, as indicated in the previous discussions, could be a result of confusion brought about by the difference between what students expect (more responsibility) and what lecturers practice (spoon-feeding).

8.3.2 Progression from Level 2 to Level 3

According to Appendix 17, stabilisation was once again more common than changes in perceptions. As in Progress from Level 1 to level 2, the most popular stabilisation was within the Perry 'C' category, followed by that within the Perry 'B' category.

There is evidence that progress from lower levels of intellectual thought to Perry 'C' thinking occurred more between Levels 2 and 3 than between Level 1 and 2 (compare A/B - C; B - C; and B/C - C in Appendices 16 and 17). This is understandable when we consider that the data were collected at late Level 1, early Level 2 and early Level 3. There was obviously not enough time for any positive changes to occur between late Level 1 and late Level 2. On the other hand, it could be thought that the courses offered at the beginning of Level 2 did not offer the opportunity for the promotion of intellectual growth in students.

To find out the extent of regression and progress/growth that occurred between Level 2 and 3, the results from Appendix 17 were summarised in Table 8.6 below. In Questions 1, 2, 3, and 5, there were evidently more cases of growth than those of regression. In these questions, it was also observed that there were more cases of stabilisation than those of growth or regression. Question 6 was the only one in which there was a slightly higher proportion of cases of regression than growth.

Table 8.6: Frequencies and Proportions (in brackets) of students who Underwent Different Changes in Perceptions between Levels 2 and 3 (Part 2)

Change	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
0	5 (26.3)	3 (15.8)	4 (21.1)	7 (36.8)	7 (36.8)	8 (42.1)
+	10 (52.6)	12 (63.2)	13 (68.4)	6 (31.6)	9 (47.7)	5 (26.3)
-	4 (21.1)	3 (15.8)	2 (10.5)	6 (31.6)	2 (10.5)	6 (31.6)

These results differ only slightly from those obtained in Part 1. In Part 1, it was observed that there were more cases of stabilisation than change in perceptions, and more cases of regression than growth. It has to be noted however, that in Part 1, the extent of agreement with statements was investigated. Even if a student, for instance, remained within the Perry 'C' category, but moved from strongly agreeing with a statement to just agreeing with it, this was categorised as a regression. This could not be detected in Part 2, and this might explain why the results from Part 1 and Part 2 differed. One cannot confidently tell which part of the questionnaire was more accurate than the other at finding out about the students' perceptions, but the fact that both managed to show evidence of more stabilisation than change means that this might not have been a chance result. The fact that 2nd Year students in general, failed to progress to upper levels of thought was corroborated, and can therefore not be denied.

8.3.3 Overall progression from Level 1 to Level 3

As in the discussion of Part 1 results, the difference between Level 1 and Level 3 perceptions was also investigated. The frequencies and proportions of students undergoing the different changes were recorded in Appendix 18. Question 6 was not included as it was different at Level 1 and Level 3.

Appendix 18 shows that most students moved between Perry 'B' and 'C' categories than they did between these categories and Perry 'A'. This confirms Perry's finding that most students at 1st year of university would have already gone past Perry 'A' thinking. Perry 'C' thinking was evidently more common than Perry 'B' thinking.

The results for the movement between Level 1 and Level 2, and Level 2 and Level 3 both showed that stabilisation was more common than changes in perception, and that regression was more common than growth. One could therefore expect that the overall progression between Levels 1 and 3 show the same trend of changes in students' perceptions.

To find out if this was the case for the overall progression from Level 1 to Level 3, the results in Appendix 18 were summarised and recorded in Table 8.7.

Table 8.7:Frequencies and Proportions (in brackets) of students who Underwent Different Changes in Perceptions between Levels 1 and 3

Change	Question 1	Question 2	Question 3	Question 4	Question 5
0	9 (47.7)	10 (52.6)	15 (78.9)	8 (42.1)	8 (42.1)
+	4 (21.1)	2 (10.5)	1 (5.26)	4 (21.1)	5 (26.3)
-	5 (26.3)	2 (10.5)	3 (15.8)	7 (36.8)	5 (26.3)

Table 8.7 confirms that overall, most of the students' perceptions did not change between Level 1 and Level 3. This does not necessarily mean that no changes occurred at 2nd Year, but that if they did, most students reverted to their original ways of thinking at Level 3. This finding shows that the students managed to overcome the problems they experienced at 2nd Year. This assumption is made on the knowledge that most of the stabilisations were within the Perry 'C' category.

The results also show that regression was more common than growth in two questions only (Qs 3 & 4), while growth was more common than regression in only one question. These results could be taken to mean that regression was generally more common than growth. Though the magnitude of these differences was not as great as in the comparisons made before, it can be seen that this difference has some significance to the study in that it is in line with the findings of Sections 8.3.2 and 8.3.3.

8.3.4 Conclusion

When all the results are looked at, one gets the impression that generally, the students perceptions did not change that much as they moved from 1st to 3rd Year. Though the 2nd Year experience seemed to negatively affect the students' perceptions, the 3rd Year was found to be effective at taking students back to their initial way of thinking. For the cases in which changes in perception were observed, there was an impression that growth was not as common as regression. This means that more effort has to be put into engaging students in processes that would challenge, encourage and support them to develop to higher levels of intellectual thought.

CHAPTER NINE

SUMMARY OF CONCLUSIONS

9.1 Introduction

The previous chapters have offered extensive discussions of the observed trends in the results from the comparisons of the High School pupils with University Level 1 students; the comparison of students from the Universities Of Botswana and Glasgow; the comparison of students in different levels within each university; and the comparison of staff with students in the University of Glasgow. Within the discussions offered in each chapter were summaries of the observed trends in results. This chapter seeks to offer a summary of all the conclusions that can be drawn from the findings of this research.

9.2 Summary of Conclusions Drawn from the Findings of the Research

Several conclusions can be drawn from the findings of this research, some of which are acknowledged to be only speculations, and not fact, made in light of the observed trends in the results. The most distinctive conclusions drawn out of these results are given below, and these are categorised according to the comparisons made between the different groups. The conclusions are presented in numbered point-form for ease of reference later in Chapter 10.

9.2.1 Conclusions drawn out of comparison of High School pupils and Level 1 university students

• *9.2.1a* - High School pupils were generally more dependent on teachers than Level 1 students were on their lecturers. This led to a further assumption that this dependence might be nurtured by the High School teaching culture.

• *9.2.1b* - Both High School pupils and Level 1 students had Perry 'C' attitudes towards the nature of scientific knowledge, with both acknowledging its multiplistic and relativistic nature.

• *9.2.1c* - High School pupils tended to be unsure of whether scientific knowledge represented the 'Absolute Truth', while Level 1 students were clearly sure that this is not necessarily the case at all times.

• *9.2.1d* - High School pupils were generally in favour of memorising given facts while the Level 1 students preferred more to look for patterns and relationships among facts.

• *9.2.1e* - Though both High School pupils and Level 1 students agreed that they could possibly learn from their peers and improve their levels of understanding through comparing themselves with others, the former did so more strongly than the latter. A further assumption that High School pupils appreciated group-work more than Level 1 students was drawn on the basis of the finding that higher proportions of the former indicated that they preferred working with others than working solo.

• *9.2.1f* - In general, Perry 'A' thinking was more dominant than both Perry 'B' and 'C' thinking at both High School and Level 1 University when it came to the issue of exam format. The modal category (on the option scale) for this aspect was however, Perry 'A' for High School and Perry 'B' for Level 1. This led to the conclusion that High School pupils preferred short questions asking for straight facts while Level 1 students were not too sure about this.

• *9.2.1g* - Both High School pupils and Level 1 students had Perry 'A' thinking when it came to the issue of exam content. The two groups preferred questions based on what the instructors taught in class. This attitude was stronger at High School than at Level 1 University.

• *9.2.1h* - Perry 'C' thinking was generally more dominant than either Perry 'A' or 'B' thinking at both High School and Level 1 University, though higher proportions of Perry 'C' thinkers were found at University than High school. Perry's assertion that nowadays students reach Perry 'C' thinking even before reaching university is therefore supported.

• *9.2.1i* - High School pupils tended to have stronger attitudes or opinions about issues than Level 1 students, whether these were Perry 'A' or 'C' related. It was concluded that High school leavers generally have high expectations that become damped on reaching university.

This was also supported by some Level 1 students' statements to the effect that they had to oblige to what the system required, even though they knew better.

• *9.2.1j* – Even though the High School pupils might have been more dependent on teachers than Level 1 students, there was an indication that they were aware of the need to, and prepared to take up responsibility for their own learning.

9.2.2 Conclusions drawn out of comparison of students at different levels of university studies at both GU and UB

• *9.2.2a* – Though Perry 'C' thinking was dominant at all levels of university studies when it came to issues relating to student/lecturer roles, the students still expressed their preference for being supplied with information to help them cut down on their work load.

• *9.2.2b* - The fact that higher proportions of 4th Year students exhibited Perry 'C' thinking than other levels led to the conclusion that 4th year students at both universities were more intellectually mature where issues of their own responsibilities were concerned.

• *9.2.2c* – Though the students in both universities, and GU staff seemed to agree that students ought to do independent studies, there were some Perry 'B' thinkers who feared that if asked to do so, they might find it difficult to identify relevant information and sources. Some members of staff did not even have faith in the students' ability to work on their own.

• *9.2.2d* – From the comments made by some students and staff, it can be concluded that the curricula were too compact to allow students to do some independent work.

• *9.2.2e* - GU students were clearly opposed to being given decisive views on issues by lecturers while UB students seemed to be uncomfortable with being exposed to multiplicity.

• *9.2.2f* - Students at all levels in both universities were opposed to simple memorisation and preferred to look for patterns and relationships between issues.

• *9.2.2g* - Though the students indicated that that they were against rote-learning, some of their comments led to the conclusion that they might have been forced to regurgitate by the way things were, e.g. too much work to do and the assessment techniques used.

• *9.2.2h* – From the results, it could also be concluded that students behaved in a manner that spelt lack of intellectual growth, not necessarily because they were underdeveloped, but because they wanted to satisfy the demands of their courses and their instructors, as they perceived them to be, or felt that there was no need to push themselves as all was given to them.

• *9.2.2i* - Faith in the worth of peers as alternative sources of information increased with increasing level of study at GU.

• *9.2.2j* – The responses from some students (and staff) led to the conclusion that though they knew of the potential value of group-work, they did not believe it was the best forum for learning.

• *9.2.2k* - The fact that UB students had stronger agreements on the issue of possible benefit from working with peers than their GU counterparts led to the assumption that the former might have grown to appreciate working together as they shared limited resources.

• *9.2.2l* - Perry 'A' thinking was more dominant than both Perry 'B' and 'C' thinking at lower levels at GU when it came to the issue of exam format, while Perry 'B' thinking dominated at the upper levels. This led to the conclusion that the lower levels still preferred to be given facts and be tested on them in short questions, while the upper levels were unsure of this.

• *9.2.2m* - First Year students at UB were unsure of whether learning facts and being tested on them in short questions was beneficial to them (i.e., they exhibited Perry 'B' thinking), while the upper levels clearly exhibited Perry 'C' thinking on this issue.

• *9.2.2n* - Both UB and GU students at all levels exhibited Perry 'A' thinking on the issue of exam content, with all preferring questions based on what the lecturers taught in class. UB students exhibited stronger perceptions on this issue than their GU counterparts.

• *9.2.2o* - Perry 'C' thinking was generally dominant at all levels in both universities than either Perry 'A' or 'B' thinking, except in issues relating to assessment, where Perry 'A' and 'B' thinking dominated.

• *9.2.2p* - GU students agreed mildly with most Perry 'C' statements while UB students generally took stronger standpoints.

• *9.2.2q* - The transition from lower to higher levels of intellectual thought did not necessarily go linearly with advancement in level of studies at both universities. GU students experienced problems at late Level 2 while UB students did so at Level 3. This finding, together with the reports of the 'sophomore slump' experienced in the United States led to the conclusion that there might be something intrinsic in the systems of higher learning that shocks students after they go through earlier levels of their studies that needs to be investigated.

• *9.2.2r* – The students' responses to some of the questions in Part 2 of the questionnaire led to the conclusion that they were aware of, and appreciated the fact that their courses aimed at equipping them with skills that they would find valuable in the future once they leave university.

• *9.2.2s* – From the responses of most students, including the final year students, it was observed that most of them were not confident enough to express their views before their peers. This led to the conclusion that they were therefore not well equipped to meet the demands of life after university, where they would be forced to do so.

9.2.3 Conclusions drawn out of the comparison of GU staff and students

• *9.2.3a* - Both students and staff exhibited Perry 'C' thinking in issues relating to their roles, view of knowledge and roles of peers.

• *9.2.3b* - In most of the issues, the staff had stronger agreements with the Perry 'C' statements than the students, leading to the conclusion that there was a gap between the students' and staff's expectations.

• *9.2.3 c* – Though the staff expressed that they wanted students to look for more information on their own, the type of assessment techniques (Multiple-choice format) they seemed to use were not suitable for assessing individually collected information.

• *9.2.3d* – From the staff's distribution on assessment format, showing a modal Perry 'B' thinking, it could be concluded that they knew short questions were not good for assessing students, yet they were not totally against them.

• *9.2.3e* - Though the staff generally had stronger perspectives than students, they only agreed mildly to the presentation of multiple perspectives to students. This led to the assumption that even though they knew this was the right thing to do, they were not too keen on doing it.

• *9.2.3f* - Perry 'B' and 'C' thinking were equally common within the staff population when it came to the issue of exam format, with Perry 'B' being modal. This led to the conclusion that the staff, like the upper levels of students at GU, were confused as to whether testing students for facts with short questions was good or bad.

• *9.2.3g* - Since the staff distribution on the issue of exam format was more or less similar to those of students, it was concluded that the students might have been led to this type of thinking by what was practised by staff.

• *9.2.3h* - The expectations of staff were totally opposed to those of students when it came to the issues of exam content. The students preferred short questions based on lectures while lecturers expected more from them. This led to the assumption that there was lack of proper communication of expectations.

• *9.2.3i* - It was only on the issue of exam content that the students exhibited clearly Perry 'A' thinking. Based on the students' and staff's comments, it was concluded that this regression into Perry 'A' thinking might have been brought about by practice.

• *9.2.3j* - From the comments written by some members of staff, it could be concluded that the students were being disadvantaged because staff could not deal with the large numbers of students in their classes.

9.2.4 Conclusions about the nature of the questionnaire

• *9.2.4a* - This questionnaire has proved to be quite sensitive in detecting the differences in the perceptions of students at different levels of studies, thereby proving to be suitable for investigating intellectual developmental differences.

• *9.2.4b* - The questionnaire has also proved to be useful for diagnostic purposes, as it managed to show that students had problems at certain levels in their courses.

• *9.2.4c* - The questionnaire has also proved to be applicable at different universities, and also confirmed Perry's 'theory' that students do follow a certain line of intellectual development while at university or college, though they might meet some obstacles along the way.

PAGE

NUMBERING

AS ORIGINAL

CHAPTER NINE

SUMMARY OF CONCLUSIONS

9.1 Introduction

The previous chapters have offered extensive discussions of the observed trends in the results from the comparisons of the High School pupils with University Level 1 students; the comparison of students from the Universities Of Botswana and Glasgow; the comparison of students in different levels within each university; and the comparison of staff with students in the University of Glasgow. Within the discussions offered in each chapter were summaries of the observed trends in results. This chapter seeks to offer a summary of all the conclusions that can be drawn from the findings of this research.

9.2 Summary of Conclusions Drawn from the Findings of the Research

Several conclusions can be drawn from the findings of this research, some of which are acknowledged to be only speculations, and not fact, made in light of the observed trends in the results. The most distinctive conclusions drawn out of these results are given below, and these are categorised according to the comparisons made between the different groups. The conclusions are presented in numbered point-form for ease of reference later in Chapter 10.

9.2.1 Conclusions drawn out of comparison of High School pupils and Level 1 university students

• *9.2.1a* - High School pupils were generally more dependent on teachers than Level 1 students were on their lecturers. This led to a further assumption that this dependence might be nurtured by the High School teaching culture.

• *9.2.1b* - Both High School pupils and Level 1 students had Perry 'C' attitudes towards the nature of scientific knowledge, with both acknowledging its multiplistic and relativistic nature.

• *9.2.1c* - High School pupils tended to be unsure of whether scientific knowledge represented the 'Absolute Truth', while Level 1 students were clearly sure that this is not necessarily the case at all times.

• *9.2.1d* - High School pupils were generally in favour of memorising given facts while the Level 1 students preferred more to look for patterns and relationships among facts.

• *9.2.1e* - Though both High School pupils and Level 1 students agreed that they could possibly learn from their peers and improve their levels of understanding through comparing themselves with others, the former did so more strongly than the latter. A further assumption that High School pupils appreciated group-work more than Level 1 students was drawn on the basis of the finding that higher proportions of the former indicated that they preferred working with others than working solo.

• *9.2.1f* - In general, Perry 'A' thinking was more dominant than both Perry 'B' and 'C' thinking at both High School and Level 1 University when it came to the issue of exam format. The modal category (on the option scale) for this aspect was however, Perry 'A' for High School and Perry 'B' for Level 1. This led to the conclusion that High School pupils preferred short questions asking for straight facts while Level 1 students were not too sure about this.

• *9.2.1g* - Both High School pupils and Level 1 students had Perry 'A' thinking when it came to the issue of exam content. The two groups preferred questions based on what the instructors taught in class. This attitude was stronger at High School than at Level 1 University.

• *9.2.1h* - Perry 'C' thinking was generally more dominant than either Perry 'A' or 'B' thinking at both High School and Level 1 University, though higher proportions of Perry 'C' thinkers were found at University than High school. Perry's assertion that nowadays students reach Perry 'C' thinking even before reaching university is therefore supported.

• *9.2.1i* - High School pupils tended to have stronger attitudes or opinions about issues than Level 1 students, whether these were Perry 'A' or 'C' related. It was concluded that High school leavers generally have high expectations that become damped on reaching university.

This was also supported by some Level 1 students' statements to the effect that they had to oblige to what the system required, even though they knew better.

• *9.2.1j* – Even though the High School pupils might have been more dependent on teachers than Level 1 students, there was an indication that they were aware of the need to, and prepared to take up responsibility for their own learning.

9.2.2 Conclusions drawn out of comparison of students at different levels of university studies at both GU and UB

• *9.2.2a* – Though Perry 'C' thinking was dominant at all levels of university studies when it came to issues relating to student/lecturer roles, the students still expressed their preference for being supplied with information to help them cut down on their work load.

• *9.2.2b* - The fact that higher proportions of 4th Year students exhibited Perry 'C' thinking than other levels led to the conclusion that 4th year students at both universities were more intellectually mature where issues of their own responsibilities were concerned.

• *9.2.2c* – Though the students in both universities, and GU staff seemed to agree that students ought to do independent studies, there were some Perry 'B' thinkers who feared that if asked to do so, they might find it difficult to identify relevant information and sources. Some members of staff did not even have faith in the students' ability to work on their own.

• *9.2.2d* – From the comments made by some students and staff, it can be concluded that the curricula were too compact to allow students to do some independent work.

• *9.2.2e* - GU students were clearly opposed to being given decisive views on issues by lecturers while UB students seemed to be uncomfortable with being exposed to multiplicity.

• *9.2.2f* - Students at all levels in both universities were opposed to simple memorisation and preferred to look for patterns and relationships between issues.

• *9.2.2g* - Though the students indicated that that they were against rote-learning, some of their comments led to the conclusion that they might have been forced to regurgitate by the way things were, e.g. too much work to do and the assessment techniques used.

• *9.2.2h* – From the results, it could also be concluded that students behaved in a manner that spelt lack of intellectual growth, not necessarily because they were underdeveloped, but because they wanted to satisfy the demands of their courses and their instructors, as they perceived them to be, or felt that there was no need to push themselves as all was given to them.

• *9.2.2i* - Faith in the worth of peers as alternative sources of information increased with increasing level of study at GU.

• *9.2.2j* – The responses from some students (and staff) led to the conclusion that though they knew of the potential value of group-work, they did not believe it was the best forum for learning.

• *9.2.2k* - The fact that UB students had stronger agreements on the issue of possible benefit from working with peers than their GU counterparts led to the assumption that the former might have grown to appreciate working together as they shared limited resources.

• *9.2.2l* - Perry 'A' thinking was more dominant than both Perry 'B' and 'C' thinking at lower levels at GU when it came to the issue of exam format, while Perry 'B' thinking dominated at the upper levels. This led to the conclusion that the lower levels still preferred to be given facts and be tested on them in short questions, while the upper levels were unsure of this.

• *9.2.2m* - First Year students at UB were unsure of whether learning facts and being tested on them in short questions was beneficial to them (i.e., they exhibited Perry 'B' thinking), while the upper levels clearly exhibited Perry 'C' thinking on this issue.

• *9.2.2n* - Both UB and GU students at all levels exhibited Perry 'A' thinking on the issue of exam content, with all preferring questions based on what the lecturers taught in class. UB students exhibited stronger perceptions on this issue than their GU counterparts.

• *9.2.2o* - Perry 'C' thinking was generally dominant at all levels in both universities than either Perry 'A' or 'B' thinking, except in issues relating to assessment, where Perry 'A' and 'B' thinking dominated.

• *9.2.2p* - GU students agreed mildly with most Perry 'C' statements while UB students generally took stronger standpoints.

• *9.2.2q* - The transition from lower to higher levels of intellectual thought did not necessarily go linearly with advancement in level of studies at both universities. GU students experienced problems at late Level 2 while UB students did so at Level 3. This finding, together with the reports of the 'sophomore slump' experienced in the United States led to the conclusion that there might be something intrinsic in the systems of higher learning that shocks students after they go through earlier levels of their studies that needs to be investigated.

• *9.2.2r* – The students' responses to some of the questions in Part 2 of the questionnaire led to the conclusion that they were aware of, and appreciated the fact that their courses aimed at equipping them with skills that they would find valuable in the future once they leave university.

• *9.2.2s* – From the responses of most students, including the final year students, it was observed that most of them were not confident enough to express their views before their peers. This led to the conclusion that they were therefore not well equipped to meet the demands of life after university, where they would be forced to do so.

9.2.3 Conclusions drawn out of the comparison of GU staff and students

• *9.2.3a* - Both students and staff exhibited Perry 'C' thinking in issues relating to their roles, view of knowledge and roles of peers.

• *9.2.3b* - In most of the issues, the staff had stronger agreements with the Perry 'C' statements than the students, leading to the conclusion that there was a gap between the students' and staff's expectations.

• *9.2.3 c* – Though the staff expressed that they wanted students to look for more information on their own, the type of assessment techniques (Multiple-choice format) they seemed to use were not suitable for assessing individually collected information.

• *9.2.3d* – From the staff's distribution on assessment format, showing a modal Perry 'B' thinking, it could be concluded that they knew short questions were not good for assessing students, yet they were not totally against them.

• *9.2.3e* - Though the staff generally had stronger perspectives than students, they only agreed mildly to the presentation of multiple perspectives to students. This led to the assumption that even though they knew this was the right thing to do, they were not too keen on doing it.

• *9.2.3f* - Perry 'B' and 'C' thinking were equally common within the staff population when it came to the issue of exam format, with Perry 'B' being modal. This led to the conclusion that the staff, like the upper levels of students at GU, were confused as to whether testing students for facts with short questions was good or bad.

• *9.2.3g* - Since the staff distribution on the issue of exam format was more or less similar to those of students, it was concluded that the students might have been led to this type of thinking by what was practised by staff.

• *9.2.3h* - The expectations of staff were totally opposed to those of students when it came to the issues of exam content. The students preferred short questions based on lectures while lecturers expected more from them. This led to the assumption that there was lack of proper communication of expectations.

• *9.2.3i* - It was only on the issue of exam content that the students exhibited clearly Perry 'A' thinking. Based on the students' and staff's comments, it was concluded that this regression into Perry 'A' thinking might have been brought about by practice.

• *9.2.3j* - From the comments written by some members of staff, it could be concluded that the students were being disadvantaged because staff could not deal with the large numbers of students in their classes.

9.2.4 Conclusions about the nature of the questionnaire

• *9.2.4a* - This questionnaire has proved to be quite sensitive in detecting the differences in the perceptions of students at different levels of studies, thereby proving to be suitable for investigating intellectual developmental differences.

• *9.2.4b* - The questionnaire has also proved to be useful for diagnostic purposes, as it managed to show that students had problems at certain levels in their courses.

• *9.2.4c* - The questionnaire has also proved to be applicable at different universities, and also confirmed Perry's 'theory' that students do follow a certain line of intellectual development while at university or college, though they might meet some obstacles along the way.

9.3 Implications of the Study and Recommendations for Instruction and Assessment

Some of the above conclusions show that there are some areas where staff need to concentrate in order to ensure that the students progress intellectually as desired. Most of the recommendations for action have been discussed in Chapters 5, 6, 7 and 8. In this section, only the most pertinent issues will be revisited briefly, and ideas of how to deal with these issues provided. This should provide only a brief summary, and to make this possible, the issues are addressed in point form:

• There were indications that some students might have been unable to look for relevant information on their own. This is evidently a Perry 'B' phenomenon, and to help students develop beyond this, staff could try and provide training on how to use available resources. Pre-Entry Science Courses offered to students before commencement of their actual degree programmes could serve this purpose well. This could take the form of Pre-Entry Science Courses that used to be offered at the University of Botswana, in collaboration with the Free University of Amsterdam. Such courses train students on the handling and manipulation of resources and apparatus, as well as on the basic skills of scientific communication (written and oral). These courses would also ensure that less time is spent on introducing the basics of the courses once the main courses commence, and this could help to cut down the amount of material presented to students. Once the material to be presented is thinned out, students would possibly find more opportunities for independent work, which is necessary to ensure intellectual development.

• There was also evidence to the effect that students were not being given enough opportunity to exercise independence and their own ingenuity. Engaging students in activities that removed their dependence on staff could help achieve this. This could take the shape of higher order problem-solving scenarios where the problems posed are 'ill-structured', and the students are given different combinations of complete or incomplete data, familiar or unfamiliar methods, open or closed goals/outcomes (Johnstone, 1993). On a much higher level, students could be engaged in Problem-Based Learning (PBL) scenarios. PBL approaches suggest a strong role for factors such as authenticity and student independence, and act as a vehicle for encouraging student ownership of the learning environment, according to Greening (1998) at www.utmb.edu/meo/f0000012.htm. These are obviously characteristics consonant with higher levels of intellectual development, according to the Perry scheme.

• Mismatches between student and staff expectations were clearly evident, with staff expectations being much higher than those of students. Research has shown that students model their activities around their experiences (Bowden & Ference, 1998). Bennett, Dunne, and Carre` (2000) also write:

> ...Laurillard (1993) found that students alter their approach to learning depending on their orientation towards the task and on their perceptions of the teaching the receive and the task in hand. Students also react to a situation as they perceive it (which is not always the way that teachers or researchers define it)...(Bennett, Dunne, & Carre`, 2000, pg. 73)

One of the principles for good practice in undergraduate education suggested by Chickering & Erhmann (1993/4) at www.aahe.org/technology/erhmann.htm reads:

> ...Good Communicates High Expectations: Expect more and you will get it. High expectations are important for everyone – for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy...

It is therefore clear that students need to be told what it is that is expected of them to avoid these mismatches.

• The most important finding, still under staff and student expectations, was that the staff's perceptions were totally opposed to those of students when it came to the issue of exam content. The importance of communication, as well as that of matching practice with intentions, need to be stressed here. Some writers have noted how assessment methods affect student learning:

> ...Another factor influencing learning is assessment, and Ramsden (1991) found that the form of assessment used could have an impact on whether students took surface or deep approaches to learning...(Bennett, Dunne, & Carre`, 2000, pg. 73)
> ...Student learning is affected by a number of factors, including the quality of teaching, student approaches to learning, and access to and availability of resources. However, the most powerful single influence on the quality of student learning is probably the assessment system tat is used...(Crooks, 1998 & Gibbs, 1992 in Chalmers and Fuller, 1996, pg. 41)
> ...The way in which any form of assessment is introduced to students will have a significant effect on their perceptions of it and their subsequent behaviour...it is frequently the case that students' views of what is required by an exam differ markedly from the views of lecturers... (McDowell & Sambell in Brown & Glasner, 1999, pg. 72)...

The staff therefore need to show their expectations by exposing students to the appropriate methods of assessment, instead of using lower-order assessment formats which would not manage to encourage students to develop to higher levels of intellectual thought. The use of what has now come to be known as Performance Assessment is recommended. This entails a departure from the traditional methods that do not empower students, but only encourage them to engage in rote-learning.

The most important point being put across here is the need for dialogue between the staff and students, without which programmes would continue to fail to achieve their aims. Further more, students need to be challenged, encouraged and supported to help them develop to higher levels of intellectual thought.

9.4 Limitations of the Study and Recommendations for Future Studies

Despite the wealth of useful data that was accumulated from this research, there were some elements that limited its success. Most studies of human development, regardless of the aspect of development studied, require observing subjects over extended periods of time. Such studies benefit mostly from following similar groups of individuals as they progress through different phases of development, and documenting any existing changes or stabilisations. As stated earlier on, an attempt was made to follow a group of individual from the 1st to the 3rd year of their undergraduate biology course. Access to these students proved impossible, the main reason for this being the issue of time. The schedules of both students and staff seemed too tight to allow for the administration of the questionnaires. The fact that this project had to be carried out within a short three-year period meant that other groups also had to be pursued at the same time, which was difficult to achieve.

Even if it had been possible to pursue the same group of students over this three-year period, the results would have been unsatisfactory as a fuller picture could only be achieved by following the students to the completion of their course. In future studies, enough time would have to be available to make sure that as much useful data as possible is compiled, preferably from following a single group of students from 1st to 4th year.

The time constraint also worked against making a complete comparative study between the Universities of Botswana and Glasgow. Had more time been available, the staff of the University of Botswana would have also been included in the study. This would have made it possible to explore the issue of the influence of staff on students further. In future studies however, to get more concrete information on this issue, direct questions would have to be asked on how students felt the actions of staff influenced their approach to their studies. This does not mean to imply that there was not enough data in this study to allow for the making of these conclusions, as the comments from the students provided this information.

It was also because of the time constraint that it was impossible to arrange follow-up interviews with students. This would have provided invaluable first-hand information as to what might have caused changes (or lack thereof) in perceptions as the students progressed through their courses. Had there been enough time, conducting even more interviews could have made up for the loss of information that occurred because of the malfunction of the recorders used. In the future, this could be taken care of by deploying more research assistants in order to target larger numbers of interviewees.

The nature of the data compiled, especially from the free response section, meant that a lot of time had to be spent on its analysis. The research required that a lot of data be collected within the time constraint, therefore it would have been better if there had been enough time afterwards to analyse the data without rushing through it. In this regard, the study proved, without doubt, that it was not meant to be a one-man venture, but needed more people to have been involved in the analysis of the data. In the same way as Perry conducted his studies, several people would need to be involved in the future, especially those with expertise on the subject to make informed decisions on the assignment of the respondents' statements to the different Perry categories.

The staff of the University of Glasgow gave a lot of useful hints on the need for rephrasing some of the items on the questionnaire. Suggestions were made in Chapters 5 and 6 on how these could be changed. Had there been enough time, these changes would have been made and the questionnaires re-administered. This information will however, be used in the next studies.

In the discussion of Perry's work in Chapter 3, it was made clear that the Perry 'C' category can be divided into different levels, depending on how one handles multiplicity, relativism and commitment. In the three-category scheme used in the study, these three levels of Perry 'C' thinking cannot be differentiated, yet it is known that by the time they finish higher education, most students are still operating at the lower level of this category. In future research, it might be worthwhile to include items that go beyond relativism to commitment, to find out if any of the staff and students might have reached such levels. Perry himself admitted that times are changing, and that high school pupils are nowadays reaching levels that they did not before. This he observed over ten years ago, so it might be possible that further changes in the perceptions of students might have occurred during the last decade with changes in technology and approaches to education.

This research has undoubtedly shown how Perry's work could be used for diagnosis of problems in the intellectual growth of students at tertiary level, which could aid in the improvement of instruction and assessment. More studies need to be carried out along these lines to make tertiary education what it purports to be, a system geared towards producing responsible, accountable and skilled citizens.

REFERENCES

Ashby, E. Cited in Jones, D.T.L. 1973. Tertiary Science Courses in Relation to the Needs of Industry. In *Aims, Methods and Assessment in Advanced Science Education* ed. by Billing, D.E. & Furniss, B.S. London, New York & Rheine (Germany): Heydon & Son Ltd. pp. 29-38

Bahar, M. 1996. *A Diagnostic Study of Concept Difficulties in Secondary School Biology Courses*. MSc – University of Glasgow.

Barrow, R. & White, P. (Eds.) 1993. *Beyond Liberal Education – Essays in honour of Paul H. Hirst*. London: Routledge,

Barrows, H.S. 1994. *Practice-Based Learning Applied to Medical Education*. Springfield, Illinois: Southern Illinois University School of Medicine.

Beard, R. 1973. Objectives in Teriary Science Education. In *Aims, Methods & Assessment in Advanced Science Education* ed. by Billing, D. E. & Furniss, B. S. London, New York & Rheine (Germany): Heyden & Son Ltd. pp 3-13

Bennett, N., Dunne, E. & Carre', C. 2000. *Skills Development in Higher Education and Employment*. Buckingham (UK): The Society for Research into higher Education and Open University Press.

Biggs, J. 1999. *Teaching for Quality Learning at University*. Buckingham, (UK): The Society for Research in Higher Education (SRHE) and Open University Press,

Billing, D. E. & Furniss, B. S. 1973. *Aims, Methods & Assessment in Advanced Science Education*. London, New York & Rheine (Germany): Heyden & Son Ltd.

Black, P.J. 1998. *Testing: Friend or Foe? – The Theory and Practice of Assessment and Testing*. London & Washington: The Falmer Press (A member of the Taylor and Francis Group)

Boydell, T. 1976. *Experiential Learning*. Manchester: Manchester Monographs 5

Brennan, J., de Vries, P., & Williams, R. (Eds) 1997. *Standards and Quality in Higher Education*. London, Bristol & Pennsylvania: Jessica Kingsley Publishers.

Brereton, J.L 1944. *The case for Examinations – An Account of Their Place in Education with Some Proposals for Their Reform*. London: Cambridge University Press.

Brew, A. 1999. Towards Autonomous Assessment – Using Self-Assessment and Peer-Assessment. In *Assessment Matters in Higher Education – Choosing and using Diverse Approaches* ed. by Brown, S. & Glasner, A (Eds.) Buckingham (UK): The Society for Research into Higher Education & Open University Press. pp 159-171

Bridges, D. (Ed.) 2000. *Education, Autonomy and Democratic Citizenship – Philosophy in a Changing World*. London & New York: Routledge – A Taylor & Francis Group.

Brown, S. & Glasner, A (Eds.) 1999. *Assessment Matters in Higher Education – Choosing and Using Diverse Approaches*. Buckingham (UK): The Society for Research into Higher Education & Open University Press.

Brown, S. 1999. Institutional Strategies for Assessment. In *Assessment Matters in Higher Education – Choosing and Using Diverse Approaches* ed. by Brown, S. & Glasner, A. Buckingham (UK): The Society for Research into Higher Education & Open University Press. pp 3-13

Brown, S. 1999. Assessing Practice. In *Assessment Matters in Higher Education – Choosing and Using Diverse Approaches* ed. by Brown, S. & Glasner, A. Buckingham (UK): The Society for Research into Higher Education & Open University Press. pp 95-105

Bryce, G. K. & Humes, W. M. (Eds.) 1999. *Scottish Education*. Edinburgh: Edinburgh University Press.

Cassels, J. R. T. & Johnstone, A. H. "The Meaning of Words and the Teaching of Chemistry". *Education in Chemistry*, 01/1983, **20**(1),10-11

Chalmers, D. & Fuller, R. 1996. *Teaching for Learning at University*. London: Kogan Page Limited.

Cox, R. 1973. Forms of Assessment in Tertiary Education. *In Aims, Methods & Assessment in Advanced Science Education* ed. by Billing, D. E. & Furniss, B. S. London, New York & Rheine (Germany): Heyden & Son Ltd. pp 119-124

Crooks, T. J. "The Impact of Classroom Evaluation Practices on Students" *Review of Education Research*, 1988, 58, 438-481 Cited in *Skills Development in Higher Education and Employment* by Bennett, N., Dunne, E. & Carre', C.. Buckingham (UK): The Society for Research into higher Education and Open University Press.

Entwistle, N. Recent Research on Student Learning and the Learning Environment. Cited in *Teaching and Learning in Further and Higher Education* by Soden, R. 1999. In *Scottish Education* ed. by Bryce, G. K. & Humes, W. M. Edinburgh: Edinburgh University Press. pp 605-615

Finster, D.C. "Developmental Instruction (I) – Perry's Model of Intellectual Development". *Journal of Chemical Education*, 08/1989, **66**(8), 659-661.

Finster, D.C. "Developmental Instruction (II) – Application of the Perry Model to General Chemistry". *Journal of Chemical Education*, 09/1991, **68**(9), 752-756

Fosnot, T. C. (Ed.) 1996. *Constructivism – Theory, Perspectives and Practice*. New York & London: Teachers' College Press, Columbia University.

Gibbs, G. & Jenkins, A. (Eds.) 1992. *Teaching Large Classes in Higher Education – How to Maintain Quality with reduced Resources*. London: Kogan Page Limited.

Gibbs, G. 1996. Improving the Quality of Student Learning. Bristol: Technical and Education Services, 1996 Cited in *Teaching for Learning at University* by Chalmers, D. & Fuller, R. London: Kogan Page Limited.

Gipps, C. V. 1994. *Beyond Testing - Towards a Theory Of Educational Assessment.* London & Washington D.C: The Falmer Press (A member of the Taylor & Francis Group).

Glasner, A. 1999. Innovations in Student Assessment – A System-wide Perspective. In *Assessment Matters in Higher Education – Choosing and using Diverse Approaches* ed. by Brown, S. & Glasner, A (Eds.) Buckingham (UK): The Society for Research into Higher Education & Open University Press. pp 14-27

Gould, J. S. A.1996. Constructivist Perspective on Teaching and Learning in the Language Arts. In *Constructivism – Theory, Perspectives and Practice* ed. by Fosnot, T. C. New York & London: Teachers' College Press, Columbia University. pp 92-100

Gray, C. A 1997. *Study of Factors Affecting a Curriculum Innovation in University Chemistry.* PhD – University of Glasgow.

Grinnell, F. 1987. *The Scientific Attitude.* Boulder, Colorado & London: Westview Press, Inc. & Frederick A. Praeger.

Hadden, R. A. 1991. *Problem Solving at the Bench – 100 Mini-Projects in Chemistry for 14-16 Year olds.* Glasgow University.

Haselgrove, S. 1994. *The Student Experience.* Buckingham (UK): The Society for Research into Higher Education & Open University Press.

Horgan, J. 1966. *The End of Science – Facing the Limits of Knowledge in the Twilight of the Scientific Age.* UK & Addison-Wesley (USA): Little, Brown & Company.

Horton, T. (Ed.) 1990. *Assessment Debates.* Milton Keynes, (UK): Hodder & Stoughton, Open Univeristy Press.

Johnstone, A. H. " Can the Slipper Fit? – Grade – Related Criteria for School Science" *The School Science Review*, 06/1987, **68**(245), 737-758

Johnstone, A. H. 1993. Why Is Science Difficult To Learn? In *Teaching, Learning and assessment in Science Education, ES821 Reader for OU* ed. by Edwards, D., Scanlon E. & West, R. London: Paul Chapman Publishing Ltd.

Johnstone, A. H. Why is Science Difficult to Learn? Things are Seldom What They Seem. *Journal of Computer Assisted Learning*, 1991, 7, 75-83

Johnstone, A. H. 1993. *Introduction for the booklet 'Creative Problem Solving in Chemistry'* ed. by O'Driscoll, C. & Reed, N. Piccadilly, London: Education Division, The Royal Society of Chemistry.

Johnstone, A. H. 1998. *Evaluation of Innovation – A Case Study.* Hull: Project Improve.

Jones, D.T.L. 1973. Tertiary Science Courses in Relation to the Needs of Industry. In *Aims, Methods and Assessment in Advanced Science Education* ed. by Billing, D.E. & Furniss, B.S. London, New York & Rheine (Germany): Heydon & Son Ltd. pp. 29-38

Kneffelkamp, L. L. 1999. *Introduction to Forms of Ethical and Intellectual Development During the College Years – The Scheme* by Perry, W. G. California 94104: Jossey-Bass, Inc.

Laurillard, D. Rethinking University Teaching: A Framework for the Effective Use of Educational Technology. Cited in *Skills Development in Higher Education and Employment* by Bennett, N., Dunne, E. & Carre', C. 2000. Buckingham (UK): The Society for Research into higher Education and Open University Press.

Lewis, D. G. 1967. *Statistical Methods in Education.* London: University of London Press Ltd.

Lumsdaine, E. & Lumsdaine, M. 1995. *Creative Problem Solving – Thinking Skills for a Changing World.* USA: McGraw-Hill.

MacGuire, P. R. P. & Johnstone, A. H. " Techniques for Investigating the Understanding of Concepts in Science". *International Journal of Science Education*, 1987, **9**(5), 565-577

Mapuru, P. A 1994. *Study of Mini-Projects and Motivation in School Biology.* MSc – University of Glasgow.

McDowell, L. & Sambell, K. 1999. The Experience of Innovative Assessment – Student Perspectives. In *Assessment Matters in Higher Education – Choosing and Using Diverse Approaches* ed. by Brown, S. & Glasner, A. Buckingham (UK): The Society for Research into Higher Education & Open University Press. pp 71-82

Meichtry, Y. J. "The Impact of Science Curricula on Student Views about the Nature of Science". *Journal of Research in Science Teaching*, 1993, **30**(5), 429-443

Nightingale, P. & O'Neil, M. 1994. *Achieving Quality Learning in Higher Education.* London: Kogan Page Ltd.

Opacic, S. The Student Learning Experience in the Mid-1990's. In *The Student Experience* ed. by Haselgrove, S. Buckingham (UK): The Society for Research into Higher Education & Open University Press. 1994. pp 157-168

Osgood, C. E. "The Nature and Measurement of Meaning" *Psychological Bulletin*, 1952, **49**(3), pp 197-237

Perry, W. G. 1999. *Forms of Ethical and Intellectual Development During the College Years – The Scheme.* California 94104: Jossey-Bass Inc.

Race, P. 1999. Why Assess Innovatively?. In *Assessment Matters in Higher Education – Choosing and Using Diverse Approaches* ed. by Brown, S. & Glasner, A. Buckingham (UK): The Society for Research into Higher Education & Open University Press, pp 57-70

Radford, J., Raaheim, K., de Vries, P. & Williams, R. 1997. *Quantity and Quality in Higher Education.* London & Bristol: Jessica Kingsley Publishers.

Ramsden, P. 2000. "A Performance Indication of Teaching Quality in Education – The Course Experience Questionnaire". *Studies in Higher Education*, 16, No. 2, 1991. pp. 129-150 Cited in *Skills Development in Higher Education and Employment* by Bennett, N., Dunne, E. & Carre', C. Buckingham (UK): The Society for Research into higher Education and Open University Press.

Ravetz, J. R. 1997. Simple Scientific truths and Uncertain Policy realities – Implications for Science Education. In *Studies in Science and Maths Education* ed. by Donnelly J. Leeds: University of Leeds, pp 5-18

Regan-Smith, M. Small, P Jr., Obenshain, S. S., Zeitz, H., Richards, B., & Woodward, C. 1994. Students Leaning through Rote Memorisation in Traditional Compared to Problem-Based Schools – Is it Different?. In *Practice-Based Learning Applied to Medical Education* ed. by Barrows, H.S. Springfield, Illinois: Southern Illinois University School of Medicine.

Resnick, L. B. & Resnick, D. P. 1994. Assessing the Thinking Curriculum: New Tools for educational Reform. Cited In *Changing Assessments: Alternative Views of Aptitude, Achievement and Instruction* ed. by Gifford, B. & O'Connor, M. London: Kluwer Academic Publishers.

Robbins C.B. 1963. *The Robbins Higher Education Report of the Committee appointed by the Prime Minister under the Chairmanship of Lord Robbins (1961-63)* – Presented to Parliament by the Prime Minister by Command of Her Majesty in October 1963. London: Her Majesty's Stationery Office.

Roberts, D., Higgins, T. & Lloyd, R. 1992. *Higher Education – The Student Experience.* Leeds: PCAS.

Rothblatt, S. 1997. *The Modern University and its Discontents – The Fate of Newman's legacies in Britain and America.* Cambridge: Cambridge University Press.

Sadler, R. 1994. Formative Assessment and the Design of Instructional Systems. Cited In *Beyond Testing - Towards a Theory Of Educational Assessment* ed. by Gipps, C. V. London & Washington D.C: The Falmer Press (A member of the Taylor & Francis Group).

Salmon, P. 1994. Research Students' Perceptions. In *The Student Experience* ed. by Haselgrove, S. Buckingham (UK): Society for research into Higher Education & Open University Press. pp 141-145

Selepeng, D. B. 1995. *Teaching and Learning Science in a Second-Language.* MSc – University of Glasgow.

Shaw, R. 1999. Institutional and Curricular Structures in the Universities of Scotland. In *Scottish Education* ed. by Bryce, G. K. & Humes, W. M. Edinburgh: Edinburgh University Press. pp 615-626

Soden, R. 1999. Teaching and Learning in Further and Higher Education. In *Scottish Education* ed. by Bryce, G. K. & Humes, W. M. Edinburgh: Edinburgh University Press. pp 605-615

Solomon, J. "The Classroom Discussion of Science-Based Social Issues Presented on TV – Knowledge, Attitudes & Values". *International Journal of Science Education*, 1992, **14**(4), 431-444

Tate, A. & Thompson, J.E. 1994. The application of Enterprise Skills in the Workplace. In *The Student Experience* ed. by Haselgrove, S. Buckingham, (UK): The Society for Research into Higher education & Open University Press. pp 127-140

Thune, C. 1997. The Balance Between Accountability and Improvement – The Danish Experience. In *Standards and Quality in Higher Education* ed. by Brennan, J., de Vries, P., & Williams, R. (Eds). London, Bristol & Pennsylvania: Jessica Kingsley Publishers. pp 87-103

Tibbitts, F. 2000. Individualism, Collectivism and Education in Post-Totalitarian Europe. In *Education, Autonomy and Democratic Citizenship – Philosophy in a Changing World* ed. by Bridges, D. London & New York: Routledge – A Taylor & Francis Group.

University of Botswana Calendar (1999/2000). Gaborone, Botswana: Published by University of Botswana, Printed by Associated Printers.

Walford, G. & Pickering, W.S.F. (Eds.) 1998. *Durkheim and Modern Education.* London: Routledge.

Westberg, J. & Jason, H. 1996. *Fostering Learning in Small Groups - A Practical Guide.* New York N.Y.: Springer Publishing Company, Inc.

Wilson, J.D. 1981. *Students Learning in Higher Education.* London: Groom Helm Ltd.

Wolf, A., Kelson, M., & Silver, R. 1994. Learning in Context: Patterns of Skills Transfer and Training Implications. Cited In *Beyond Testing - Towards a Theory Of Educational Assessment* ed. by Gipps, C. V. London & Washington D.C: The Falmer Press (A member of the Taylor & Francis Group).

Woods, D. R. 1994. *Problem-Based Learning - How To Gain the Most from PBL.* Waterdown, ON: Donald R. Woods Publishers.

Young, G. 1999. Using Portfolios for Assessment in Teacher Preparation and Health Sciences. *In Assessment Matters in Higher Education – Choosing and Using Diverse Approaches* ed. by Brown, S. & Glasner, A. Buckingham (UK): The Society for Research into Higher Education & Open University Press. pp 122-131

INTERNET SOURCES

Albanese, M. & Mitchell, S. "Problem-Based Learning – A Review of the Literature on its Outcomes and Implementation Issues". *Academic Medicine*, 68, No. 1, 1993. pp 52-81 at http://edweb.sdsu.edu/clrit/learningtree/PBL/DisPBL.html

Angier, N. 1996. Review of Horgan's (1966) book: 'The End of Science – Facing Limits of Knowledge in the Twilight of the Scientific Age'. New York Times, 30.06/96, 11-12. at www.virtualscholl.edu/mon/SocialConstruction/TheEndOfScience

Blunden, A. 1998. *Knowledge for Sale*. at http://home.mira.net/~lynnbea/andy/knowage.htm

Blunden, A. 1998. *Knowledge and Value.* at http://home.mira.net/~lynnbea/andy/know&val.htm

Bonds, C., Cox, C. III, & Gantt-Bonds, L. 1993. Curriculum Wholeness through Synergistic Teaching. In *Integrated Curriculum* By Lake, K. 1994. at www.nwrel.org/scpd/sirs/8/c016.html

Bouchard, T. J. .1969. in Goldenberg *et al* at www.sciencemag.org/cgi/content/full/285/5433/1495

Bowden, J. & Ference, M. 1998. *The University of Learning - Beyond Quality and Competence in Higher Education*. London: Kogan Page. at www.unca.edu/et/br110698.html

Brown, S. Race, P. & Smith, B. 1996. *500 Tips on Assessment – An Assessment Manifesto.* London: Kogan Page. at www.lgu.ac.uk/deleberations/assessment/manifest.html

Bruffee, K. 1995. Collaborative Learning – Higher Education, Interdependence, and the Authority of Knowledge. In *What Do We Know About Students' Learning and How Do We Know It?* By Cross, P. K. American Association for Higher Education's 1998 National Conference on Higher Education. at www.aahe.org/cross_lecture.htm

Camp, G. "Problem-Based Learning – a Paradigm Shift or a Passing Fad?" *Medical Online*, at www.utmb.edu/meo/f000003.pdf

Chickering, A.W. & Gamson, Z,F. 1987). *Seven Principles for Good Practice in Undergraduate Education* – AAHE Bulletin, March, 3-7, in Woods (996) at www.chemeng.mcmaster.ca/pbl/chp1.htm

Connolly *et al* (1993) Cited in Goldenberg, J., Mazursky, D. & Solomon, S. 1999. *Essays in Science and Society: Creative Sparks.* at www.sciencemag.org/cgi/content/full/285/5433/1495

Cross, P. K. *What Do We Know About Students' Learning and How Do We Know It?* American Association for Higher Education's 1998 National Conference on Higher Education. at www.aahe.org/cross_lecture.htm

Donovan, Sam. 2000). *The BioQUEST Curriculum Consortium* (Beloit College, USA), at www.bioquest.org/

Dressel, P. 1958. The Meaning and Significance of Integration. In *Integrated Curriculum* By Lake, K. 1994. at www.nwrel.org/scpd/sirs/8/c016.html

Durkheim, E. *Pragmatism and the Question of Truth.* at http://home.mira.net/~gaffcam/phil/durkheim.htm

Finkle, S. L. & Torp, L. L. 1995. Introductory Documents (Available from the Centre for Problem-Based Learning, Illinois Math and Science Academy, 1500 West Sullivan Road, Aurora, IL 60506 – 1000), in Kreger, C. (1997/8), Problem-Based Learning, Wheeling Jesuit University/NASA Classroom of the Future™ at http://cotf.edu/ete/teacher/tprob/teacherout.html

Goldenberg, J.; Mazursky, D. & Solomon, S. *"Creative Sparks". Science Magazine*, 03/09/99, 285(5433),1495-1496, by The American Association for the Advancement of Science at www.sciencemag.org/cgi/content/full/285/5433/1495

Good, C. Dictionary of Education. (3rd ed.) 1994. In *Integrated Curriculum* By Lake, K. at www.nwrel.org/scpd/sirs/8/c016.html

Grace, C. *Portfolios*. At www.ncrel.org/sdrs/areas/issues/students/earlicld/ea51143.htm

Greening, T. 1998. *Scaffolding for Success in Problem-Based Learning*. at www.utmb.edu/meo/f0000012.htm

Heylighen, F. 1998. *Formulating the Problem of Problem-Formulation.* at http://pespmc1.vub.ac.be/Papers/Problem-Formulation.html

Heylighen, F. 1998. *Problem-Solving*. at http://pespmc1.vub.ac.be/PROBSOLV.html

Humphreys, A., Post, T. & Ellis, A. 1994. Interdisciplinary Methods – A Thematic approach. In *Integrated Curriculum* By Lake, K. at www.nwrel.org/scpd/sirs/8/c016.html

Jacobs, H. H. 1989. Interdisciplinary Curriculum – Design and Implementation. In *Integrated Curriculum* By Lake, K. 1994. at www.nwrel.org/scpd/sirs/8/c016.html

Kari. *Untitiled*. at http://www.honors.unr.edu/~fenimore/wt202/kari.html

Kimbell, R., Stables, K., Wheeler, T., Wosniak, A., & Kelly, V. 1991. Assessment of Performance in Design and Technology. In *Problem-Based Learning: Helping Your Students Gain The Most from PBL (3rd Edition) (Instructors' Guide for Problem-Based Learning: How to Gain The Most from PBL)*, by Woods, D. R. 1996. at http://chemeng.mcmaster.ca/pbl

Kreger, C. *Planning, Facilitating, Assessing – Ideas for Individual Products*. at http://cotf.edu/ete/teacher/indprodassess.html

Kulieke, M., Bakker, J., Collins, C., Fennimore, T. Fine, C., Herman, J., Jones, B. F., Raack, L., & Tinzman, M. B. 1990. *Why Should Assessment be Based on a Vision of Learning*. Oak Brook (USA): North Central Regional Educational Laboratory, at www.ncrel.org/sdrs/areas/rpl_esys/assess.htm

Kumar, V. S. 1996. *Collaborative Learning.* at www.cs.usask.ca/grads/vsk719/academic/890/project2/

Lake, K. 1994. *Integrated Curriculum.* At www.nwrel.org/scpd/sirs/8/c016.html

Levine, A. 1996. *Problem-Based Learning - An Overview.* at www.mcli.dist.maricopa.edu/pbl/info.html

Matthews, R. S., Cooper, J. L., Davidson, N. & Hawkes, P. *Building Brodges Between Co-operative and Collaborative Learning.* at www2.emc.maricopa.edu/innovation/CCl/building.html

Mathison, C. & Mason, C. 1989. *Planning Interdisciplinary Curriculum – A Systematic and Co-operative Approach.* at http://volcano.und.nodak.edu/vwdocs/msh/llc/is/icp.html

McAllister, H. C. 1994. *21st Century Problem Solving - How to Solve Problems.* at www.hawaii.edu/suremath/why1.html#literature

Mims III, F.M.. "Amateur Science – Strong Tradition, Bright Future" *Science Magazine*, 02/04/99, 285(5411), 54-56, by the American Association for the Advancement of Science at www.sciencemag.org/cgi/content/full/284/5411/55

Murphy, N. Helping Preservice Teachers Master Authentic Assessment for Learning Cycle Model. Cited in *Planning, Facilitating, Assessing – Ideas for Individual Products* by Kreger, C. at http://cotf.edu/ete/teacher/indprodassess.html

Nganunu, J. (Botswana Chief Justice). "Educational System Should Empower and Develop Citizens". *The Botswana Daily News*, 25/08/00 at www.gov.bw/cgi/news.cgi?d=20000825&I=Educational_system_should_empower_and_develop_citizens

Panitz, T. A. *Definition of collaborative versus Co-operative Learning.* at www.lgu.ac.uk/deliberations/collab.learning/panitz2.html

Reithlinghoefer, S. J. *The Future of Non-Traditional Interdisciplinary Programs – Margin or Mainstream?* at http://edweb.sdsu.edu/clrit/learningtree/PBL/DisPBL.html

Robbs, J. & Meredith, S. 1994, The Problem-Based Learning Curriculum at Southern Illinois University School of Medicine. In Greening, T. 1998. *Scaffolding for Success in Problem-Based Learning* at www.utmb.edu/meo/f0000012.htm

Rudner, L. & Boston, C. *A Long Overview on Alternative Assessment.* at gopher://vmsgopher.cua.edu:70/00gopher_roo_eric_ae%3A[_alt]_overv.txt

Simon, H. A., Dantzig, G. B., Hogarth, R., Piott, C. R., Raiffa, H., Schelling, T. C., Shepsle, K.A., Thaier, R., Tversky, A. & Winter, S. *Decision Making & Problem Solving* at www.dieoff.org/page163.htm

Society for Scientific Exploration. 1998-2000. A Message from the President – Peter Sturrock at www.scientificexploration.org

Stefani, L. & Orsmond, P. *The Importance of Student/Tutor Dialogue in the Understanding of Marking Criteria in Assessment Procedures.* at www.lgu.ac.uk/deliberations/assessment/abstracts2.html

Stix, A. 1996. *Empowering Students through Negotiable Contracting to Draft Rubrics for Authentic Assessment.* At www.interactiveclassroom.com/neg-cont.html

Swanson, D. B., Case, S. M. & van der Vleuten, C. P. M. 1996. Strategies for Student Assessment. In *The Challenge of Problem-Based Learning* ed. by Boud, D & Felletti, G. London: Kogan Page. In *Problem-Based Learning: Helping Your Students Gain The Most from PBL (3rd Edition) (Instructors' Guide for Problem-Based Learning: How to Gain The Most from PBL)* by Woods, D. R. 1. at http://chemeng.mcmaster.ca/pbl

Tang, C. *Effects of Models of Assessment on Students' Preparation Strategies.* at www.lgu.ac.uk/deliberations/ocsd-pubs/isltp-tang.html

Tang, C. & Biggs, J. *Student Centred Approach to Assessment.* at www.lgu.ac.uk/deliberations/assessment/abstracts2.html

The Society of Natural Science at www.determinism.com/index.shtml © Copyright 2000 The Society of Natural Science / Peter Lawrence Gill

Unknown Author at http://search.excite.com/serach.gw?s=Scientific+society&lk=apple

Unknown Author. *Cooperative/Collaborative Learning for Active Student Involvement.* at www.virginia.edu/~trc/tccoop.htm

Unknown Author. *Tenets of Theme Teaching.* at http://hale.pepperdine.edu/~jpferiag/thematic.htm

Vardell, S. M. 1995. Thematic Units – Integrating the Curriculum. In *Teaching with Children's Books* ed. by Sorensen, M. R. & Lehman, B. H. NCTE. at www.ncte.org/teach/Vardell9069.html

Vernon, D. T. & Blake, R. L. " Does Problem-Based Learning Work? – A Meta-Analysis of Evaluative Research". *Academic Medicine*, 1993, 68(7), 550-563 at http://edweb.sdsu.edu/clrit/learningtree/PBL/DisPBL.html

Vernon, D. T. "Attitudes and opinions of Faculty Tutors about Problem-Based Learning". *Academic Medicine*, 1995, 70(3), 216-223 at http://edweb.sdsu.edu/clrit/learningtree/PBL/DisPBL.html

Waialae School homepage. *Curriculum, Instruction and Assessment.* at www.k12.hi.us/waialae/web/candi.html

Watson, G. *No More Group work Please!* at www2.emc.maricopa.edu/innovation/CCL/nomore.html

Wiesberg, R.W. 1990. Cited In Goldenberg, J.; Mazursky, D. & Solomon, S. *"Creative Sparks". Science Magazine*, 03/09/99, 285(5433), 1495-1496, by The American Association for the Advancement of Science. at www.sciencemag.org/cgi/content/full/285/5433/1495

Woods, D. R. 1996). *Problem-Based Learning: Helping Your Students Gain The Most from PBL (3rd Edition) (Instructors' Guide for Problem-Based Learning: How to Gain The Most from PBL),* at http://chemeng.mcmaster.ca/pbl

Young, R.M. *Marxism and The History of Science.* at http://www.shef.ac.uk/~psysc/staff/rmyoung/paper/pap104h.html

AN INVESTIGATION OF INTELLECTUAL GROWTH IN UNDERGRADUATE BIOLOGY STUDENTS USING THE PERRY SCHEME

(APPENDICES)

by

Ditshupo Bonyana Selepeng
B.Ed.(Sc.) (Botswana), M.Sc. (Glasgow)

A thesis submitted in part-fulfilment of the requirements for the Degree of Doctor of Philosophy (Ph.D.)

Centre for Science Education, Faculty of Science
University of Glasgow

LIST OF APPENDIXES

APPENDIX 1a

University Questionnaire Part 1

APPENDIX 1a

UNIVERSITY QUESTIONNAIRE - Part 1

UNIVERSITY OF GLASGOW

Centre for Science Education

Student Questionnaire

Year of Study 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Sex Male ☐ Female ☐

Matriculation Number ☐

This questionnaire is about your approach to learning. you are provided with pairs of opposing statements with five boxes between. By shading ONE of the boxes you can indicate which statement you agree with and how strong your agreement is .

Here is an example :

I must have background music when I study.	☐	☐	☐	☐	☐	*I cannot stand any background noise when I am studying.*

If you shade the left box, it means you agree strongly with the left-hand statement. If you shade the second box, it means you favour the left-hand statement but less strongly. The middle shading would show that you are not fussy either way. The other two boxes on the right would show agreement with the right-hand statement.

There are no right answers, only YOUR view matters. Your response to this questionnaire will not in any way affect your academic record.

Mark the appropriate responses by filling in the boxes using an HB pencil, thus ▬

NOTE : **AS** = Agree Strongly; **A** = Agree; **N** = Neutral.

	AS	A	N	A	AS	
In order to pass my course, I need to study just what the lecturer indicates or tells me.	☐	☐	☐	☐	☐	I do not have to rely totally on the lecturer. Part of my learning is to work things out myself.
I cannot be wrong if I accept what the lecturer says. If I question anything, I might end up failing.	☐	☐	☐	☐	☐	I do not believe in just absorbing what the lecturer says without question.
I believe it is the job of the lecturer to supply me with all the knowledge I need	☐	☐	☐	☐	☐	The duty of the lecturer is not to teach me everything, but to stimulate my own thinking.
I think a good lecturer should give all conflicting views on an issue and give his students a chance to evaluate them.	☐	☐	☐	☐	☐	A good lecturer is one who points out to students which is the one accepted view of an issue.
I think lecturers should avoid teaching material that they know students will find difficult.	☐	☐	☐	☐	☐	Lecturers should aim to provide challenges to their students by introducing difficult issues.
It is good to work with other students because, by listening to their points of view, I can evaluate my own.	☐	☐	☐	☐	☐	I prefer not to work with other students because then I stand less chance of picking up wrong ideas.
All one has to do in biology is to memorise things.	☐	☐	☐	☐	☐	Instead of just memorising things, it is more interesting to look for patterns and relationships among facts.
I do not believe that all scientific facts represent the 'absolute truth'. Students should try to understand arguments for and against existing knowledge.	☐	☐	☐	☐	☐	Science outlines a set of facts about what is happening in the world. A student needs to develop ways of memorising these facts.
I find short questions quite restrictive as they do not give me the opportunity to explain what I know and understand.	☐	☐	☐	☐	☐	I prefer to learn the facts and then be tested on them in short questions.
In exams I prefer questions which are based on what the lecturer taught.	☐	☐	☐	☐	☐	I like questions that demand thinking beyond what is taught in class.
I believe that what should matter in exams is the quality of my answers, not how much I write.	☐	☐	☐	☐	☐	In exams, I expect to be rewarded for giving as much information as possible.

APPENDIX 1b

University Questionnaire Part 2

APPENDIX 1b

UNIVERSITY OF GLASGOW

Centre for Science Education

University Students' Questionnaire - Part 2

Name		**Matric. No.**	

Please indicate if you AGREE or DISAGREE with each of the following statements, then justify your decision in a sentence or two.

Statement	Agree	Disagree
Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. *Justify your decision.*		
Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. *Justify your decision.*		
Learning by seeing connections between ideas is more effective than absorbing isolated facts. *Justify your decision.*		
Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. *Justify your decision.*		
Examinations should be confined only to what was taught. *Justify your decision.*		
I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. *Justify your decision.*		

Thank you for your cooperation.

APPENDIX 2a

High School Questionnaire Part 1

APPENDIX 2a - High School Questionnaire Part 1

UNIVERSITY OF GLASGOW

Centre for Science Education

NAME ☐ ***SCHOOL*** ☐

	Male	*Female*
SEX	☐	☐

This questionnaire is part of a study aimed at finding out what your views are in relation to the teaching and learning of science. Your responses will be treated confidentially and will not affect your school results.

You are provided with pairs of opposing statements with five boxes between. By shading ONE of the boxes you can show which statement you agree with and how strong your agreement is.

Here is an example :

I must have background music when I study.	☐	☐	☐	☐	☐	*I cannot stand any background noise when I am studying.*

If you shade the left box, it means you agree strongly with the left-hand statement. If you shade the second box, it means you favour the left-hand statement but less strongly. The middle shading would show that you are not fussy either way. The other two boxes on the right would show agreement with the right-hand statement.

There are no right answers, only YOUR view matters.

Mark the appropriate responses by filling in the boxes using an HB pencil, thus ▬

NOTE : **AS** = Agree Strongly; **A** = Agree; **N** = Neutral.

	AS	A	N	A	AS	
In order to pass my course, I need to study just what the teacher indicates or tells me.	☐	☐	☐	☐	☐	I do not have to rely totally on the teacher. Part of my learning is to work things out myself.
I cannot be wrong if I accept what the teacher says. If I question anything, I might end up failing.	☐	☐	☐	☐	☐	I do not believe in just cramming what the teacher says without question.
I believe it is the job of the teacher to supply me with all the knowledge I need	☐	☐	☐	☐	☐	The duty of the teacher is not to teach me everything, but to help me think for myself.
I think a good teacher should give all views on an issue and give his pupils a chance to weigh them up.	☐	☐	☐	☐	☐	A good teacher is one who points out to pupils which is the one accepted view of an issue.
I think teachers should avoid teaching material that they know pupils will find difficult.	☐	☐	☐	☐	☐	Teachers should aim to provide challenges to their pupils by introducing difficult issues.
It is good to work with other pupils because, by listening to their points of view, I can weigh out my own.	☐	☐	☐	☐	☐	I prefer not to work with other pupils because then I stand less chance of picking up wrong ideas.
All one has to do in science is to memorise things.	☐	☐	☐	☐	☐	Instead of just memorising things, it is more interesting to look for patterns and relationships among facts.
I do not believe that all scientific facts represent the 'absolute truth'. Pupils should try to understand arguments for and against existing knowledge.	☐	☐	☐	☐	☐	Science outlines a set of facts about what is happening in the world. Pupils need to develop ways of memorising these facts.
I do not like short questions as they do not give me the chance to explain what I know and understand.	☐	☐	☐	☐	☐	I prefer to learn the facts and then be tested on them in short questions.
In exams I prefer questions which are based on what the teacher taught.	☐	☐	☐	☐	☐	In exams, I like questions that give me the scope to go beyond what is taught and show my ability to think..
I believe that what should matter in exams is the quality of my answers, not how much I write.	☐	☐	☐	☐	☐	In exams, I expect to be rewarded for giving as much information as possible.

APPENDIX 2b

High School Questionnaire Part 2

APPENDIX 2b - High School Questionnaire Part 2

NAME		SCHOOL	

This is the second part of the questionnaire. In this part your are asked to indicate if you AGREE or DISAGREE with the statements that follow, and then to state (in the space provided), why.

	Agree	Disagree
Pupils should be able to get a good grade by just absorbing the information they get from class and giving it back in tests and exams.		

	Agree	Disagree
Pupils could learn better if they worked more with their fellow pupils and not just confine themselves to their notes.		

	Agree	Disagree
Learning by seeing how ideas are connected is more rewarding than cramming separate facts.		

	Agree	Disagree
Teachers are not there to give pupils all the information they need, but they are there to guide them in their learning.		

	Agree	Disagree
Examinations should be confined only to what was taught.		

	Agree	Disagree
I am very confident in myself and like saying my opinions and views in class, discussions, labs, etc.		

Thank you for your cooperation.

APPENDIX 3a

Staff Questionnaire Part 1

APPENDIX 3a - Staff Questionnaire Part 1

UNIVERSITY OF GLASGOW
Centre for Science Education
Staff Questionnaire

This questionnaire is aimed at exploring your perceptions of the teaching and learning processes in undergraduate biology. You will find that the questions deal with your views on the following : roles of students as learners; roles of lecturers; place of groupwork in teaching; nature of knowledge; and purposes and format of exams.

What Degree Levels do you teach ? 1 ☐ 2 ☐ 3 ☐ 4 ☐

What level do you teach most at? 1 ☐ 2 ☐ 3 ☐ 4 ☐

You are provided with pairs of opposing statements with five boxes between. By shading ONE of the boxes you can indicate which statement you agree with and how strong your agreement is .

Here is an example :

I must have background music when I study.	☐	☐	☐	☐	☐	*I cannot stand any background noise when I am studying.*

The closer your shading is to one extreme, the stronger your agreement is with that statement, and obviously, the stronger your disagreement is with the alternative at the other extreme. The middle shading would show that you are not fussy either way. Please mark the appropriate responses by filling in the boxes using an HB pencil, thus ☐

NOTE : **AS** = Agree Strongly; **A** = Agree; **N** = Neutral.

	AS	A	N	A	AS	
In order to pass their courses, students need to study just what the lecturers indicate or tell them.	☐	☐	☐	☐	☐	Students do not have to rely totally on the lecturers. Part of their learning is to work things out themselves.
Students cannot be wrong if they accept what the lecturers say. If they question anything, they might end up failing.	☐	☐	☐	☐	☐	Students should not believe in just absorbing what the lecturers say without question.
It is our job as lecturers to supply students with all the knowledge they need.	☐	☐	☐	☐	☐	The duty of the lecturer is not to teach students everything, but to stimulate their own thinking.
I think a good lecturer should give all conflicting views on an issue and give his students a chance to evaluate them.	☐	☐	☐	☐	☐	A good lecturer is one who points out to students which is the one accepted view of an issue.
I think lecturers should avoid teaching material that they know students will find difficult.	☐	☐	☐	☐	☐	Lecturers should aim to provide challenges to their students by introducing difficult issues.
Groupwork is good for students because, by listening to others' points of view, they can evaluate their own.	☐	☐	☐	☐	☐	Students working on their own are better off because then they stand less chance of picking up wrong ideas.
All students have to do in biology is to memorise things.	☐	☐	☐	☐	☐	Instead of just memorising things, students would find it more interesting to look for patterns and relationships among facts.
I do not believe that all scientific facts represent the 'absolute truth'. Students should try to understand arguments for and against existing knowledge.	☐	☐	☐	☐	☐	Science outlines a set of facts about what is happening in the world. A student needs to develop ways of memorising these facts.
I find short questions quite restrictive as they do not give students the opportunity to explain what they know and understand.	☐	☐	☐	☐	☐	I prefer to test students with short questions as they show exactly whether or not the students have learnt their facts well.
I prefer to base my exam questions on what I have taught in class.	☐	☐	☐	☐	☐	I like setting questions that demand thinking beyond what I have taught in class.
I believe that what should matter in exams is the quality of students' answers, not how much they write.	☐	☐	☐	☐	☐	In exams, I reward students for giving as much information as possible.

APPENDIX 3b

Staff Questionnaire Part 2

APPENDIX 3b - Staff Questionnaire Part 2

In this part of the questionnaire, it is important to state the level of students you are referring to, i.e. whether it is Level 1,2,3, or 4.

Please indicate if you AGREE or DISAGREE with each of the following statements, then justify your decision in a sentence or two.

Statement	Agree	Disagree
In tests and exams, a good grade should reflect nothing but the students' ability to process in an effective way what is taught in class. *Justify your decision.*		
Groupwork is of limited educational value in the teaching of biology. *Justify your decision.*		
Students should carry out the majority of their work on their own and learn how to explore all resources available to them without dependence on lecturers. *Justify your decision.*		
Lecturers do not have the authority to disagree with accepted scientific knowledge, and should not confuse students with their views where they disagree with books or theories. *Justify your decision.*		
The nature of biological knowledge makes it difficult to assess students using open-ended questions. *Justify your decision.*		
Our courses are very successful in promoting intellectual growth in students through the years. *Justify your decision.*		

Thank you for your cooperation.

APPENDIX 4

Comments from Members of Staff on Questionnaire

APPENDIX 4

COMMENTS FROM GU STAFF ON PART 1 OF QUESTIONNAIRE

800008: I think gender stereotypes should be avoided.

800015 : Q3; add 'to pass' in 1st statement. Q1, 3 & 11: The two wordings are not true opposites. Q9: instead of 'questions' put 'answers'.

800016: Even the recurrence of the word 'fact' in this questionnaire causes me some unease. The word idea should predominate, but only appears once.

800017: Statement 1 Q9 bizzare, don't understand question. Agree strongly with both in Q10. Several of these Qs were really difficult to answer because statements not opposites.

800026: These questions are loaded and reveal the perceptions of the person who set them (Q8 & Q9)!

800028: Agree with statement 1 Q3 for medical students & BW students. Q8: 'evidence' would be better than 'facts' - a fact can be irrefutable, but evidence can be interpreted in several ways.

800042: Q6 statement1:Not why I think groupwork is good for students. Q10:Depends if it's a Q for paper on coursework or general one, usually Qs based on c/work but students get highest marks for showing thinking & outside reading. Q11:both,short answer w/out waffle better than long waffling one but the more relevant information the better.

800043: Q4: A lecturer cannot give all views.

800044: Q10: Agree with statement 2, but hate marking the disapponting answers.

800053: Q1: Agree with statement 2 for L4. Q5 depends on level.

800056: Q8: I cannot satisfactorily resolve the ambiguities and assertion between these two statements, they are not sufficiently opposite to let me chose a middle course. Q1: replace 'questions'/ 'answers' have their virtues which, in some instances, make them preferrable.

800058: Q4 & Q8: Poor dichotomy.

GENERAL COMMENTS ON BOTH PARTS OF THE QUESTIONNAIRE

800015: I had some difficulty with the first page, hence a couple of blanks. In two instances I did not feel that the left and right hand items were true opposites. Item 3 depends on whether one is thinking of passing or doing well. On the second page, I was not always clear what was being asked. I answered only in relation to Junior Honours, as that is all I am teaching this year (two separate blocks). Since you are comparing students and staff perceptions you must be concerned with our present attitudes and experiences. However, it may help me to remark on changes. Whatever our ideals and aspirations, we have to be realistic in the context of recent downhill trends. A large proportion of students come into third year remembering few of the basic facts of their chosen subjects from L2. Some pass in L3, still ignorant of much of the L2 stuff (as our external examiner agrees). So students can pass L3 while nowhere near the old second year standard. Of course there are good students too. This means that aspirations amd expectations must differ for good and poor students.

APPENDIX 5

Raw Frequency Tables for all GU Levels (Part 1)

APPENDIX 5: Raw frequencies for all Glasgow University Levels Part 1

Question / Position	Level 1 N=677	Level 2e N=196	Level 2l N=54	Level 3 N=38	Level 4 N=54	Staff N=60
Question 1						
1	10	2	3	2	0	1
2	47	23	7	4	3	3
3	72	20	6	1	5	1
4	338	91	28	19	23	12
5	197	59	10	12	23	43
Blank	12	1	0	0	0	0
Question 2						
1	1	1	0	0	0	1
2	49	7	3	2	4	0
3	201	31	10	6	9	2
4	313	105	31	21	23	12
5	103	50	10	9	18	45
Blank	9	2	0	0	0	0
Question 3						
1	15	7	2	1	1	0
2	73	20	6	10	6	1
3	105	39	17	2	7	1
4	329	92	21	17	20	16
5	146	36	8	8	20	41
6	8	2	0	0	0	1
Question 4						
1	8	4	1	0	2	0
2	57	13	0	0	5	4
3	121	36	7	5	4	9
4	318	86	20	22	20	31
5	163	56	26	11	23	15
Blank	9	1	0	0	0	1
Question 5						
1	0	2	1	0	1	0
2	27	8	2	2	3	0
3	182	50	10	11	7	2
4	371	106	34	15	31	40
5	89	29	7	10	12	18
Blank	7	1	0	0	0	0
Question 6						
1	0	3	1	0	2	0
2	12	6	2	1	0	1
3	65	43	3	5	11	10
4	366	91	32	15	17	26
5	224	51	15	17	24	22
Blank	9	2	1	0	0	1
Question 7						
1	28	0	0	0	0	0
2	83	6	4	0	0	0
3	174	24	9	2	4	1
4	273	91	25	21	25	14
5	108	72	16	15	25	45
Blank	10	3	0	0	0	0

APPENDIX 5 continued: Raw frequencies for all Glasgow University Levels - Part 1

Question / Position	Level 1	Level 2e	Level 2l	Level 3	Level 4	Staff
Question 8						
1	3	0	1	0	0	0
2	39	10	3	1	1	0
3	116	25	8	2	3	1
4	335	94	24	16	23	14
5	171	66	18	19	24	41
Blank	12	1	0	0	3	4
Question 9						
1	109	26	7	4	6	0
2	185	48	12	4	8	4
3	234	71	22	15	21	27
4	83	37	8	9	14	19
5	57	13	5	6	2	8
Blank	8	1	0	0	3	2
Question 10						
1	155	46	21	10	7	2
2	248	68	18	19	18	7
3	170	58	11	5	14	14
4	78	18	4	3	9	25
5	16	5	0	1	3	9
Blank	9	1	0	0	3	3
Question 11						
1	16	4	2	0	0	0
2	43	15	2	2	4	1
3	109	32	12	3	5	2
4	261	82	19	14	21	22
5	236	62	19	19	21	32
Blank	11	1	0	0	3	3

APPENDIX 6a-f

High School Response Categories (Part 2)

APPENDIX 6a: High School Comment Categories – Part 2 Question 1

Q1: Pupils should be able to get a good grade by just absorbing the information they get from class and giving it back it tests and exams. **COMMENT**	**Position**	**Percentage**
Absorbing information from lessons makes it much easier to remember.	A	3.92
By absorbing and memorising all the information, pupils would be able to answer most, id not all, the questions and therefore get good marks.	A	1.96
If they learnt everything, they should have no problems in the exams.	A	1.96
This shows that the pupil has been paying attention, and has put in hard work.	A	1.96
Once the information has been given back in the test, it is less likely to be lost.	A	1.96
If the pupils have the information, then they should get good grades.	A	1.96
In most exams pupils can get a reasonable mark by general knowledge on the subject.	A	1.96
To understand the subject, one has to learn the course facts taught in class.	A	1.96
The only way to learn something is to memorise it, and if you don't know the facts then you can't expect to pass the exam.	A	1.96
Summarising everything one has learnt in class makes class time more worthwhile.	A	1.96
Pupils should get good results in tests and exams from work done in class.	A	1.96
Receiving and memorising information will be helpful towards or during the examinations, as one would know what the exam questions are about.	A	1.96
If the pupils are not supplied with the relevant information, they are at a disadvantage in exams.	A	1.96
Like myself, I believe that not all pupils are intelligent enough to have the ability to take on private study, so it's fair to pass them for giving back lessons.	**A/B**	1.96
Teachers should cover most of the work assessed in exams. This is fair.	B	1.96
Some people find studying difficult.	B	1.96
There is too much to learn in Higher-Grade sciences.	B	1.96
If the test is on class information then there would be no need to learn outside information, which is good.	B	1.96
Sometimes pupils need more than just notes to understand, they need extra help.	**B/C**	1.96
Some questions are difficult to understand, so cramming in the information doesn't mean you will pass easily.	**B/C**	1.96
At Higher-Grade there is so much work that not all the work can be crammed to a passing grade.	**B/C**	1.96
They have to understand the work they get and apply it to questions or use it in other situations, giving proper explanations, and not just regurgitate it.	C	11.76
Pupils should be able to put information in their own words.	C	5.88
Pupils should study gradually and take in the information in evenly. Too much work on information at the same time lead to no understanding and failing.	C	5.88
Exams should test your knowledge, not how much you can remember.	C	3.92
Sometimes pupils have to supply their own background knowledge and not just rely on whatever the teacher says, to develop independent learning.	C	3.92
Questions are written in different ways each year. Cramming all the information in your head doesn't necessarily mean you can understand the questions.	C	3.92
Pupils should learn other stuff apart from what's taught in class.	C	1.96
Taking in too much information may cause you to forget things, so you should take time to learn things.	C	1.96
Pupils have to work out themselves why things happen the way they do, otherwise they would not fully understand, hence fail.	C	1.96

APPENDIX 6a continued: High School Comment Categories – Part 2 Question 1

Q1: pupils should be able to get a good grade by just absorbing the information they get from class and giving it back tests and exams. COMMENT	Position	Percentage
Absorbing may be difficult as it doesn't give one proper knowledge of the facts.	C	1.96
Pupils should learn things outwith class in order to develop their ways of understanding things.	C	1.96
Agree without comment	A	5.88
Neither agree nor disagree – without comment	B	7.84
Disagree without comment	C	5.88

APPENDIX 6b: High School Comment Categories – Part 2 Question 2

Q2: Pupils could learn better if they worked more with their fellow pupils and not just confine themselves to their notes. COMMENT	**Position**	Percentage
Students need correct information from the teacher.	A	1.96
I learn better when I am lectured to, and remember it more.	A	1.96
Teachers present the right information.	A	1.96
I prefer to work more on my own, as I am free from distractions.	A	1.96
Pupils would not learn anything from each other.	A	1.96
Sometimes one needs to work with others to pick up extra information from them, but sometimes they need to rely on their own notes.	B	1.96
If you are with someone you don't like it can put you off your work, so working with friends can be a good thing.	**B/C**	1.96
This gives pupils a chance to take different points of view and ideas from others, and therefore understand and learn more.	C	25.49
This would allow pupils to help each other out with problems.	C	7.84
When the teacher is busy, the pupils could ask each other without getting embarrassed, because of smaller groups.	C	5.88
This would give pupils the opportunity to compare notes and add useful facts they didn't know.	C	5.88
Working with others makes the class more enjoyable, and so pupils would learn better.	C	5.88
This allows pupils to work at their own pace.	C	1.96
This gives one a chance to see what others think about things in the course.	C	1.96
Pupils tend to work better when they combine their efforts, only asking the teacher when they get stuck.	C	1.96
It is good to work together as this allows the learning process to be more interactive.	C	1.96
Two heads are better than one.	C	1.96
Other pupils often look at different problems in a different way from the teacher, and one might understand their solution better.	C	1.96
Others may explain things in simpler ways than taught.	C	1.96
Others can explain problems better than one's own notes.	C	1.96
It is easier to remember what one hears from other pupils.	C	1.96
Pupils need to be taught in order to learn, and if it is left to them to teach themselves, they will achieve nothing. **(A - Question misconstrued)**		1.96
Teaching should be the backbone of any classroom situation, so I disagree with working with others. **(Question misconstrued)**		1.96
I feel more confident when the teacher teaches things to us, rather than leaving us to discover everything for themselves. **(A – Question misconstrued)**		1.96
I disagree because teachers need to motivate and pace the pupils so they can finish the course at the right pace. **(A – Question misconstrued)**		1.96
If given this freedom, pupils would just sit and gossip rather than work**. (Question misconstrued)**		1.96
I disagree than pupils should work alone, but this can be helpful only when it is used with other methods. **(B – Question misconstrued)**		1.96
Disagree without comment	A	1.96
Neither agree nor disagree – without comment	B	1.96
Agree without comment	C	17.65

APPENDIX 6c: High School Comment Categories – Part 2 Question 3

Q3: Learning by seeing how ideas are connected is more rewarding than cramming separate facts. **COMMENT**	**Position**	Percentage
Facts are easier to learn and also more helpful. Connections would not be useful as they could be easily forgotten. Our brains are limited, and so can only take certain amounts of information in.	A	1.96
Both methods should be used because that way you understand it once you know the facts behind it.	**B/C**	1.96
Seeing connections improves understanding and make learning easier.	C	39.22
Seeing connection makes it easier to retain information in memory and easier to remember; while isolated facts are more difficult to memorise.	C	7.84
Connections make the work more interesting.	C	5.88
Connections give a good overall view of science, while isolated facts do not.	C	3.92
It is more rewarding to be able to identify how separated facts are related.	C	3.92
Seeing connections makes more sense of the subject.	C	1.96
Exams assess knowledge of linked facts, not isolated ones.	C	1.96
This makes you think, so you learn better.	C	1.96
It is an important part of learning to find out WHY and HOW things happen, and not just that they DO happen.	C	1.96
Connections help link topics in a subject together, thereby reducing the volume of information to be learnt. If not, subjects would be boring and attention would be lost.	C	1.96
Connections can help in visualising things mentally, therefore they make it easier to remember information.	C	1.96
Connections help form structures for questions, and develop ideas in the mind about the answers.	C	1.96
I gain more thorough understanding of things by being able to associate things and by putting things into practice. **(Question misconstrued)**		1.96
By seeing (visual impact) things you can have a real idea of how it is really like, instead of just looking at notes, which sometimes go on forever. **(Question misconstrued)**		1.96
Disagree without comment	A	1.96
Neither agree nor disagree – without comment	B	1.96
Agree without comment	C	21.57

APPENDIX 6d: High School Comment Categories – Part 2 Question 4

Q4: Teachers are not there to give pupils all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Percentage**
Teachers should be there to give pupils the information they need to pass exams.	A	7.84
If not given all the facts, pupils may fail their exams.	A	5.88
The teachers are there to educate, so should give pupils all information and also give them a full understanding of things.	A	3.92
Teachers should teach the pupils what they need to know.	A	1.96
Teachers should do both, teaching and guiding.	A	1.96
It is the teacher's responsibility to ensure pupils pass.	A	1.96
Teachers must provide all the information the pupils need, otherwise pupils might get the key points wrong.	A	1.96
If they don't give pupils everything, things would be harder for them	A	1.96
Teachers are there to explain things to pupils, not just guide them.	A	1.96
We do not come to school for lectures, we come to learn. Information is the main key to learning. We are all already guided, that's why we come to school.	A	1.96
I think teachers should provide all the information, and the pupils should then try to understand and learn it.	A	1.96
Teachers are there to guide because most don't give information that you have to learn.	B	1.96
Teachers should help when needed, but teach how to learn and keep information.	B	1.96
Teachers give all the relevant information, but also guide to help us in our learning process, but it is up to the pupils if they want to learn.	B	1.96
Teachers are there to supply all the information needed to pass an exam. If they don't, pupils would end up failing. But it's also the pupils' responsibility to learn what's needed and not rely on the teacher all the time.	**B/C**	1.96
They give most of the information, but also help students to learn for themselves.	**B/C**	1.96
I think that the teacher should give pupils the important information they need for exams before they try to learn for themselves.	**B/C**	1.96
Teachers should give a suitable amount of information for test, etc., but for learning more, it should be up to the person themselves.	**B/C**	1.96
Teachers are there to help the pupils when they need to be taught, or have done everything but still have problems.	C	3.92
Pupils need to look through revision books.	C	3.92
Learning is up to the individual and no matter how much they are lectures to, unless they wan to learn they won't.	C	1.96
If the teacher always gives pupils answers, then they would find it hard to think for themselves in exams.	C	1.96
Pupils have to go and investigate topics for themselves.	C	1.96
Pupils have to find answers for themselves.	C	1.96
A degree of self-motivation is important in learning, otherwise interest will be lost.	C	1.96
Teachers don't have time to meet everyone's needs, so they just give you homework to do.	C	1.96
If teachers keep giving pupils all the information, they will never be able to cope at college or university where they need to solve things themselves.	C	1.96
Pupils do, to an extent, need a teacher's help, that is what they are there for, but they should try guiding the pupils to independence.	C	1.96
Pupils must learn themselves and be guided by the teacher. You have to become independent in your learning otherwise you will always be dependent on others.	C	1.96

APPENDIX 6d continued: High School Comment Categories – Part 2 Question 4

Q4: Teachers are not there to give pupils all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Percentage**
I think teachers should help pupils and guide them, but I don't think they should give them all the information.	C	1.96
The teachers don't have enough time to give all the facts and the pupils should do some work themselves at home to help the teacher out a bit more.	C	1.96
The teacher's job is to help pupils help themselves by making them think about problems rather than simply giving them answers.	C	1.96
If the teachers did not teach, the pupils would just waste their time (**Question misconstrued).**		1.96
Disagree without comment	A	5.88
Neither agree nor disagree – without comment	B	3.92
Agree without comment	C	11.56

APPENDIX 6e: High School Comment Categories - Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Percentage
Exams are hard enough as it is without asking for extra information.	A	3.92
If not, pupils would end up learning all what the teacher says, only to be faced with different questions altogether.	A	3.92
In practice, pupils study, understand and have knowledge only on what they are taught or told to study.	A	3.92
Pupils shouldn't lose marks for something they don't know about.	A	1.96
It would be unfair to set questions on stuff not taught in class.	A	1.96
It is unfair to expect pupils to display any extra knowledge because the whole course is hard enough to learn and memorise as it is.	A	1.96
Exams test how well you have learnt the course not how much you know about the subject.	A	1.96
Basing exams on something not learnt in class is a waste.	A	1.96
It wouldn't be fair to put things that the pupils have not learned about in class as they would not know the answer, and would therefore fail. If they studied all year with what they were taught then they would have a greater chance of passing.	A	1.96
What pupils learn in class sticks in the mind more than what they learn alone.	A	1.96
Teachers should teach pupils the whole topic.	A	1.96
Exams should be based on what is taught because otherwise many people would end up knowing unnecessarily more than what is taught in class.	A/B	3.92
This would make preparation for exams easier and stress-free.	A/B	3.92
If exams are not based on taught material it would be harder for pupils to pass them.	A/B	1.96
It is fair to base exams on taught material. Some pupils who work hard may not know these types of 'unfair' questions while they know others.	B	3.92
Pupils don't have time to do extra study.	B	1.96
There is enough information to learn and understand without asking pupils to answer things they may not have looked into.	B	1.96
Not sure, because sometimes pupils find in exams some things that they haven't been taught, but sometimes it's the case that they haven't looked over and learned it.	B	1.96
Pupils should nit be expected too much of, as they are only learning. If the above was not the case, they would be lost, not sure what to know.	B	1.96
Any information necessary to learn should be pointed out before exams, unless it involves problem-solving.	B/C	1.96
Any general knowledge relevant to the topic should be added, it would help to test their common sense.	C	3.92
I think questions where pupils have to solve problems are important because they show the pupils can think themselves, but such questions should be based on the course itself.	C	1.96
I prefer if the questions are more interesting, i.e. if they involve developing the ideas you have learned.	C	1.96
By showing that bit of extra knowledge it shows that one is capable of working things out and that they are capable of more.	C	1.96
People should be allowed to expand their minds and not have a limit placed on them.	C	1.96
If this was to happen pupils would not bother to look at other aspects, therefore they would be restricted from widening their knowledge.	C	1.96
Exams should try and get pupils to actually bring together everything, and think carefully about what is being asked, i.e. reach the limits of what was taught and what they don't know about be could be understood.	C	1.96
For some courses, background knowledge is required in order to pass.	C	1.96

APPENDIX 6e continued: High School Comment categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught **COMMENT**	**Position**	Percentage
Not basing questions on only what was taught allows people to think for themselves, rather than just answer the question.	C	1.96
There is not point in losing marks in an exam for things that you didn't have to know, or have no relevance to you. **(Question misconstrued)**		3.92
It is impossible for pupils to answer something they are totally unaware of. **(A- Question misconstrued)**		1.96
Agree without comment	A	13.73
Neither agree nor disagree – without comment	B	3.92
Disagree without comment	C	5.88

APPENDIX 6f: High School Comment Categories – Part 2 Question 6

Q6: I am very confident that I will pass this course. / *I am very confident in myself and like saying my opinions and views in class, discussions, labs, etc.* COMMENT	**Position**	**Percentage**
I will pass if I work hard at understanding everything the teacher has taught.	A	3.26
The course is too difficult.	A	3.26
I don't know if I will pass, I have been studying it for a month only so far.	B	6.45
There is too much to learn.	B	3.26
I am not that naïve to just say I will pass now.	B	3.26
I may pass, depending on the topics and the difficulty.	B	3.26
I think I'll pass, but getting an 'A' will be hard.	B/C	12.90
If I work hard enough I should be able to pass.	A or C	16.13
I take time to learn my work hard and set times when to study.	A or C	6.45
I am smart enough to pass.	A or C	3.26
This is the second time I an doing this course, I have learnt from my mistakes and this time I am going to try hard because I need to pass.	A or C	3.26
Disagree without comment	A	9.68
Neither agree or disagree – without comment	B	0.00
Agree without comment	C	25.81
I am very shy and don't like getting embarrassed by other pupils.	*A*	*5.00*
I start to panic when the teacher asks me to speak out loud.	*A*	*5.00*
I think that you should let the teacher do what they want.	*A*	*5.00*
I am confident in some classes, the classes where I know what I'm doing.	*A/B*	*5.00*
I am rather shy and prefer writing my answers down instead of speaking out.	*B*	*15.00*
It depends on if I am comfortable in the environment and with familiar people.	*B*	*10.00*
I am told that I am a confident person, but I'm not sure.	*B*	*5.00*
I feel it is good to get your points across as at times opinions can be very hard. I like to take part in class discussions, I feel it's necessary.	*B/C*	*10.00*
Sometimes I do express my opinions, but it's better to listen to other people too.	*B/C*	*5.00*
I am confident in class, so I ask questions and express my point of view.	*C*	*5.00*
You should believe in yourself to be confident enough.	*C*	*5.00*
If I feel strongly about something, then O would give my opinion. Also by speaking out and giving your view others may benefit from your opinions.	*C*	*5.00*
I am confident in myself, and that I can learn from my mistakes and can do better in my actual exams.	*C*	*5.00*
I am a confident person and I believe my views matter both in and out of class.	*C*	*5.00*
Agree without comment	*C*	*5.00*

Note: The question in Italics is from the modified version of the questionnaire, which was answered by Bellahouston Academy pupils. Comments to this question are also in Italics.

APPENDIX 7a-f

All GU Levels' Response Categories (Part 2)

APPENDIX 7a: Glasgow University Comment Categories – Part 2 Question 1

Q1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. **COMMENT**	**Position**	**Year 1 (%)**	**Year 2e (%)**	**Year 21 (%)**	**Year 3 (%)**	**Level 4 (%)**
All or most of what one needs for exams and tests is said in lectures, this is what the system asks for, therefore one has to oblige. ***	A	5.76	2.55	1.85		
Shows diligence, therefore should be rewarded accordingly.	A	5.32	0.51	5.56		
Lectures are a major part of the course and should be examined accordingly.	A				2.63	
It's the lecturer's duty to teach what will be in exams and test on what has been taught in class.	A	2.22	2.55			
Testing students on what has been specifically taught is only fair. They should get good grades for reproducing this.	A				2.63	
If exams were not based on what was taught, then lectures would be a complete waste of time.	A		1.02			
Material from lectures should guarantee an easy pass.	A	1.18				
Shows that they have learned course material.	A		0.51	1.85		
Shows good memory.	A		0.51			
Shows good understanding of what was taught and competence.	A	1.03				
Exams assess one's understanding of what was taught.	A		0.51			
Usually, not much is required to pass, the basics are enough. ***	A	0.59				
This is the way things should be, no other way of passing.	A	0.59				
Up to the student to revise the material given by lecturer.	A	0.59				
If the facts are absorbed and known, one can pass the exam.	A	0.44				
Lecturers should, and only cover what's in the syllabus, so exams should just cover what they teach in class.	A	0.30	0.51	1.85		
Exams and coursework are not too complicated, so don't see no reason why one can't pass.	A	0.30				
Exams are fact-based and multiple choice format.	A	0.30				
Right answers show that one has met the requirements of the exam.	A	0.15				
Unusual for test and exams to include that which was not mentioned in lecturers or labs.	A	0.15				
Lecture material should be used as a determinant of whether students pass or fail.	A	0.15				
Lecturers teach correct information, and so if this is given back, students should be correct.	A	0.15				
Regular exams and tests encourage hard work.	A	0.15				
Biology tests memory. ***	A	0.15				
One can pass as long as they are clear on what they know.	A	0.15				
It makes the learning process easier.	A	0.15	1.02			
This works just fine, from my experience.	A	0.15				
Lecturers should cover everything.	A					1.85
Lecturers should provide enough material to ensure passing.	A		1.02	1.85		
Though it might not be ideal, it works fine for me.	A/B	0.15				
Should be this way for 1st Year students who are not independent yet, and those without prior knowledge, because these lot find work too overwhelming.	A/B	0.59				

APPENDIX 7a continued: Glasgow University Comment Categories – Part 2 Question 1

Q1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
Exam questions refer to lecture material but might be tricky, so understanding of **lecture** material crucial.	A/B	0.15				
If it does not appear on the indicated work to do, it should not be in exams and tests.	A/B	0.15				
It's easier to regurgitate memorised facts in exams without one's ideas and thought. Exam Qs can often simply be luck of the draw.	A/B				2.63	
Examining on material not taught would be unfair.	B			1.85		
This should be so, unless lecturer has prescribed some useful or detailed reading.	B		0.51			
Only to a certain extent.	B		0.51			
Lecturers should provide all knowledge necessary for passing. Excelling should be up to the student.	B	0.59	0.51	1.85	5.26	
Further independent thinking might be required, but main component of exams should be lecture material.	B	0.44				
Though some Qs might require reading or lectures just the skeleton for study, lecture material is usually enough to guarantee success. ***	B	0.30				
Fair to examine people on what all of them have received, though better understanding can be achieved by further reading.	B	0.15				
What is taught is what is in the syllabus, so this is what should be examined, but extension of knowledge important.	B	0.15				
Students need to be given a clear indication of what to read so that further reading can be done if better performance is sought.	B	0.15			2.63	
Could pass with absorbing ALL lecture information, but too tedious. So easier to read further on the basics.	B	0.15				
Too much material to be covered, therefore not enough time for further reading.	B	0.15	1.53	3.70		1.85
Biology is a diverse subject, easy to study wrong material.	B	0.15				
Further reading might be difficult because it is hard to get hold of books in library.	B			1.85	2.63	
Required information covered in lectures, learning this difficult enough as it is, no need to bother with unnecessary bits. ***	B	0.15				
Giving back lecture material is okay for easy topics, but not for more complex ones, essays, reports, etc.	B	0.15				
Some people do not work well under exam conditions, and this may mean that although they know relevant information, their marks may not reflect this due to exam pressure.	B				2.63	
Things are not as easy as they appear.	B	0.15				
Without lectures everybody would gather different views and information, and not know what to learn. Lectures give all common ground.	B		1.53	1.85		
Too much information out there, wouldn't know what to study, and what one studies not even come up in exams.	B			3.70		
Although extra reading helps, lectures are essential for getting the idea of what you need to know.	B		0.51	1.85	5.26	
Books are sometimes too advanced – so students have a hard time trying to select the relevant material.	B					
Some thinking, creativity, etc needed, but passing exams does not always need understanding.	B/C	0.15				
Memorising guarantees easy passing, but production of better graduates needs more than that.	B/C	0.15				
A pass should be okay, but the point of learning is to teach oneself as much as possible, form own opinions and not just mimic others.	B/C				5.26	
Questions must be based on lectures, but one's own thinking has to be demonstrated as well.	**B/C**				2.63	

APPENDIX 7a continued: Glasgow University Comment Categories – Part 2 Question 1

Q1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 21**	**Level 3**	**Level 4**
Absorbing and understanding lecture information is demanding and should warrant a good grade, but a better grade should be given if a student has knowledge from their own study as well.	B/C				2.63	
They should pass easily, but excelling needs more.	B/C	5.47	11.7	3.70	10.5	3.70
Although some extra reading is required, the majority of the information should be from lectures so that those who do extra get 'A's while those who do lectures only get 'B' s.	B/C				2.63	
Exams are based on lectures, so passing possible, but excelling could be ensured by further work, understanding, application, etc.	B/C	4.28	1.53	1.85	5.26	
Exams and tests to be restricted to what's taught in lectures – extra reading to be done for essays and labs.	B/C		1.53			
They have to give back the information, but with a bit of further reading.	B/C	2.81	1.53	3.70	2.63	1.85
Must learn what lecturer directs, but own reading essential.	B/C		0.51			
Own ideas and outside reading should be considered, though amount of reading expected is sometimes too much.	B/C					1.85
Students need to do further reading and add this to their answers, but this would be limited because there is too much to do.	B/C					3.70
If lecturers want to use outside information, references must be provided.	B/C		0.51	9.26		
Students should not be penalised for not doing further reading, but should be rewarded if they do it.	B/C					1.85
Must back up with additional reading **given by lecturer.**	B/C		1.02			
Might ensure passing, but not necessarily understanding.	B/C	0.59				5.56
Depends on what the lecturer wants. If what's it's only lecture material, that will be enough for passing, if not, more studying is necessary.	B/C	01.5				
Though a lot of material might be given in lectures, other sources do have much more.	B/C	0.15				
Further independent research/study needed to broaden one's knowledge beyond lectures and improve understanding.	C	25.3	18.9	20.4	2.63	13.0
If this were the case, then there would be no point in doing further work.	C					1.85
There is more to courses than just lectures.	C		2.04			
This should result in a minimal grade, extra reading should result in fuller answers and better grades.	C		1.02			
Learning science involves being able to examine new situations, and students should learn these skills.	C				2.63	
Understanding, interpretation, critical analysis, application, problem-solving skills, etc. have to be demonstrated and assessed.	C	11.7	6.12	7.41	7.89	16.7
A good grade should be achieved by showing you know how to think for yourself and have the ability to look up more information.	C				2.63	
Lecturers should, and only do give skeletal information in class, students need to beef it up.	C	9.60	5.59	1.85	2.63	5.56
Lecturers can't possibly give all information needed in class given the limited amount of time available.	C	2.36	3.57	1.85	2.63	
If that were the case, then there would be no point in doing further work, as even the lazy ones would pass.	C		1.53	1.85		
Multiple choice exams do not discriminate properly.	C			1.85		
Students should be rewarded for extra knowledge and work.	C		2.04	1.85	2.63	5.56
Science requires development of one's own ideas, not knowledge of a list of facts.	C					1.85
Science requires an inquisitive mind, and further research on what one is taught	C					1.85
Students should provide their own views and opinions, independent thought and conclusions, to show understanding.	C	1.92	2.55			9.26

APPENDIX 7a continued: Glasgow University Comment Categories - Part 2 Question 1

Q1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
This would restrict students' thinking and working, and hence understanding.	C		2.55		2.63	1.85
Exams should and also contain stuff that was not taught in class, even totally unknown material.	C	1.92	1.02			
Students should also be examined on their knowledge and understanding of a wider range of material than what's in the lectures.	C		0.51			
If lecturers gave everything, other sources like textbooks would be redundant.	C		0.51			
Giving back information doesn't show understanding or intelligence.	C	1.48	3.06	3.70	5.26	1.85
Regurgitation is not good for learning science.	C			1.85		
Necessary to get information and views from other sources besides the lecturer and look at things critically.	C	0.74	0.51			1.85
The student would be as good as parrot. More could be learnt through further study.					2.63	
This would be a test of memory, not understanding.	C					1.85
This would be a test of memory, not intellectual ability.	C		0.51			1.85
Leads to memorisation, which is not learning as it provides no challenges, and hence no progress.	C	0.59	2.04	1.85		
Not good to just absorb (absorption is for sponges!!).	C		0.51			
Students have differing capabilities and speeds of working.	C	0.59				
Memorised information is not easy to apply in different situations.	C	0.44				
Memorised information is easily forgotten.	C	0.44				
Information gathered independently is easier to remember.	C		0.51			
Absorbing without understanding makes the material difficult to learn.	C	0.44				
Absorbing lecture material only does not show interest.	C					1.85
Learning only what's in lectures makes the process boring.	C					1.85
Students find independent work more interesting and rewarding.	C		1.02		2.63	
Lecturers often instruct students to do further reading.	C	0.44				
Lecturers are not infallible, can make mistakes, might fail to explain things well, or give irrelevant information at times.	C	0.44				
Students should show initiative.	C					3.70
This is university, students should learn to find things out for themselves.	C	0.30	0.51	1.85		
One should be prepared for challenges outwith lecture material.	C	0.15				
Learning is for future application, therefore memorising what's in lectures won't benefit one much then.	C	0.15				
Work should be enjoyed too, makes it easier to learn.	C	0.15				
After graduation, jobs will require finding things out for oneself.	C		0.51			
This would produce poor incompetent graduates unaccustomed to reading.	C		1.02			
It would be boring, labs make it more interesting. **(Question misconstrued)**				1.85		
Do not need lectures only, practical work necessary to do as well **(Question misconstrued).**		1.18			2.63	

APPENDIX 7b: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. COMMENT	Position	Year 1 (%)	Year 2e (%)	Year 2l (%)	Year 3 (%)	Year 4 (%)
Generally, students are lazy and need coercion to work, they would not do much work under these circumstances.	A	4.28				
Some students might be too shy to ask questions when there are a lot of students.	A	0.74				
I prefer to work alone at my own pace alone.	A	0.59	2.55			
I prefer to learn the coursework totally alone, unless absolutely stuck.	A	0.30				
Working together does not necessarily mean students work any harder, in fact, they might end up doing nothing.	A	0.44	0.51			1.85
Not all students participate willingly in groups.	A		1.02			1.85
Some students might end up just taking others' views without thinking for themselves.	A	0.44				
Group work not ideal because not everyone pulls his/her weight.	A	0.15				
Students would not turn up when given this freedom, the jump from school where everything is given is bad enough already.	A	0.15				
No need for further group discussions as labs provide this already.	A	0.30				
They are already given this freedom, no one says you are alone.	A	0.30				
The opportunity to ask lecturers given after lectures, so a separate time for discussions not necessary.	A	0.15				
At university level, people should not need help from fellow students.	A	0.15				
Students can mislead and confuse each other as they might not have the right knowledge.	A	0.15	0.51			
Some students cannot be relied upon.	A				2.63	
Working with others could be more of a hindrance than a help.	A		0.51			
Students are so loud that it is impossible to work with them.	A		0.51			
It is easier to concentrate on your own.	A			1.85		1.85
Students easily go off-track during group discussions.	A	0.15		1.85		1.85
Outside the university, efficient study can only occur when working solo because socialising gets in the way of study.	A		0.51			
Discussions can be difficult as students might have bad communication problems.	A					1.85
When students work/talk with others, there can be too much debate that can cloud the issue.	A				2.63	
Some students need time to work on subjects, therefore better off working on their own.	A	0.15				
Some students work better alone.	A		0.51		2.63	
The statement is simply 'new-age mumbo jumbo'.	A	0.15				
One is better off getting all the necessary information and examples from lectures than reading a book which provides only one person's opinion.	A	0.15				
This requires too much discipline.	A	0.30				
Unsupervised study could lead to misconceptions.	A	0.15				
Students might not be able to collect all the correct information.	A	0.15				
It is more beneficial to have someone who knows a lot about the subject to inform you about correct information.	A	0.30				

APPENDIX 7b continued: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Effective study uses all the senses, lectures good as they involve hearing and sight.	A	0.15				
Lecturers are the first people students look to for information.	A	0.15				
Most of the stuff one needs is in lectures, so no need for group work. ***	A		0.51			
I don't think any of the group projects we did helped with studying.	A				2.63	
At this stage, it looks like learning lecture notes is all that is required, so one is better off working alone. ***	A			1.85		
Students could end up frustrated and put off by listening to those who appear to know more than they do.	A		0.51			
It is up to the student to make this choice, but it would not work in reality.	A/**B**	0.15				
Students could end up being confused by the variety of opinions and teaching styles, they are better off working solo.	**A**/B	0.15				
No need to work with others who might interfere with one's work, whatever one doesn't understand will always be in books.	**A**/B		0.51			
Students can look for information by themselves, **don't always** need others.	A/**B**		0.51			
Students study in different ways, so it should be up to the individual how they work.	A/**B**		0.51			
Sometimes nothing gets done during group work, therefore, students need direction.	**A**/B		0.51			
This is good as it would be more like a school environment.	A/B	0.15				
Students need to know what they will be examined on. **(Question misconstrued – A/B)**		**0.15**				
Too much freedom is not necessarily a good thing. **(Question misconstrued – A/B)**		**0.15**				
It provides a forum for challenging each others' ideas, but working solo is also important.	B					1.85
Depends on the individual. At times working with others might only yield misconceptions, whereas it might be beneficial at other times.	B		1.02			3.70
People study in different ways, but working with others could still help in developing other skills.	B		0.51			
Discussions would be good if students were not pressurised to provide opinions.	B		0.51			
One needs to be told by lecturer what type of information and what depth they have to go into.	B	1.62				
This could be good for some students, but maybe not for others.	B	1.33	3.06	1.85	2.63	
It could work either way.	B			1.85		
In some ways, one could improve their learning by working at textbooks etc. but in other cases it is helpful to talk to other students.	B		0.51			
Sometimes lectures not necessary, students can work independently and learn more alone.	B	0.30				
Lecturers should explain difficult issues more to students for better understanding.	B	0.44				
Theoretically, this is a good thing to do, but it would not work in reality.	B	0.44				
It's not easy to get help at university, therefore students are often confused.	B	0.44				
This could work only if students were more committed.	B	0.15				
Though this could help students discuss ideas and problems, it would be time-consuming.	B	0.30				

APPENDIX 7b continued: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 21**	**Level 3**	**Level 4**
I prefer to work at my own pace, but sometimes I feel I benefit from views of others.	B	0.30				
This should be done only to a certain extent, lecturers needed to keep order.	B	0.30				
Better all round marks(??).	B	0.15				
Some students don't like approaching lecturers after the lecture, so group work helpful.	B	0.15				
Working together would help, but lower category students need more help.	B	0.15				
Learning is only effective where there is motivation.	B	0.15				
No need to approach students and lecturers if one knows what to study, unless when help is really needed.	B	0.15				
Students have too much to do within a limited amount of time.	B	0.15				
Easier to get all information from lecturer and asking others if having problems.	B	0.15				
Students already have enough time for working on their own, though this could help.	B	0.15				
Other students and lecturers can 'hinder' you with their ideas but can also help – depends on topic.	B	0.15				
Although this might be helpful, students don't need to work with others.	B	0.15				
Although discussions are important, if they are on the wrong track and don't know answer within the group, it's easy to get misled.	B				2.63	
Would work only if a moderator is there to stop wrong ideas from spreading (Problem Based Learning sessions didn't work for our class)	B					1.85
Working with others can be productive, but it could also be a waste of time.	B				2.63	
I prefer to discuss biology with people who know nothing about it than with biologists.	B		0.51			
People always have differing interests and views.	B/C			1.85		
Students find it easier to understand each other more than lecturers (they think at same level, use 'same language', free with each other).	B/C	1.48	1.02	1.85		
This helps, but students need guidance from lecturers.	B/C	0.15				
Even though students could learn a lot from each other, they could also learn as much from textbooks and journals.	B/C				2.63	
They shouldn't confine themselves to lecture notes, but I personally prefer to work alone.	B/C		0.51			1.85
It might be possible to pick up better ways of learning but I'm not sure which is best.	B/C		0.51			
Working with others helps, but one has to balance between working with others and working independently.	B/C		1.02	5.56		1.85
Though this could help students discuss ideas and problems, it would be time consuming.	B/C		0.51			
Ideally this would be helpful, but it is impossible to do.	B/C			1.85		
Although sharing information is valuable, not everyone likes group work and talks during this, so tutorials should be optional.	B/C		1.02	3.70		
Working with others may aid learning, but students can do just as well alone.	B/C		1.53			
Talking about a topic is better than reading about it.	B/C	0.15				
Working with others is helpful only sometimes.	B/C		1.02			
Group work only works when studying topics out of lectures.	B/C					1.85
Don't confine myself to lecture notes. Use other sources (books, TV, internet). Even talk to students who generally know nothing anyway.	B/C		0.51			

APPENDIX 7b continued: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. COMMENT	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Students usually have the same problems, so discussing these with a lecturer would help.	B/C		0.51			
If the question means lecturers are not necessary, then I disagree, because they are vital in providing knowledge, structure and idea of exam content. (**Question misconstrued - B**)		**0.30**				
No matter how good you are, there are still questions you can ask the lecturer. (**Question misconstrued - B**)		**0.15**				
Students would not know if they were studying things that would be in a test. (**Question misconstrued - B**)		**0.59**				
Students need freedom to work, but also require a bit of a shove in the right direction. (**Question misconstrued - B**)		**0.15**				
Science is about investigation and research, students should get practice at this. But at the start, lecturers should help. (**Q misconstrued - B**)		**0.15**				
Lecturers necessary to keep students working at a rate essential for dealing with the work available, and for giving them the necessary structure, whereas freedom could result in them falling behind. (**Question misconstrued - B**)		**2.66**				
Lectures are essential for giving students a starting point (**Question misconstrued - B**).		**1.92**				
Lectures necessary for giving structure at First Year – freedom necessary later. (**Question misconstrued - B**)		**0.59**				
Lecturers should provide the majority of needed information, further reading to be done for better understanding. (**Q misconstrued - B**)		**0.74**				
Students need help from lecturers and students all the time, they would feel lost, not confident and unsupported alone. (**Q. misconstrued - B**)		**0.74**				
Students have the freedom they need during their own free time, lectures, labs, etc. are necessary. (**Question misconstrued - B**)		**0.59**				
Lecturers should be available to answer students questions, working with others valuable but not good for assessment. (**Q misconstrued - B**)		**0.15**				
Deadlines and assessment remove the fun in learning, therefore freedom is good. (**Question misconstrued - B**)		**0.15**				
Though working with other students is good, too much freedom is not good. (**Question misconstrued - B**)		**0.15**				
Even though lectures are necessary from keeping students on the right track, freedom would give them a chance to look deeper into their work (**Question misconstrued - B**)		**0.15**				
Freedom to work does not necessarily lead to better learning, just a different sort of learning (**Question misconstrued - B**).		**0.15**				
This gives them the opportunity to work on what appeals to them, but this would mean no proper classes. (**Question misconstrued - B**)		**0.15**				
Students would be able to work at a level that suits them and on what they know they need to know (**Question misconstrued – B/C**).		**0.74**				
One has to learn to be independent, and work with others only sometimes. (**Question misconstrued – B/C**)		**0.44**				
Independent study might be necessary, but one needs to be taught large core of material in lectures.(**Question misconstrued – B/C**)		**0.15**				
Lecturers usually give different view-points from books, so attending lectures helps in thinking about them more. (**Q misconstrued – B/C**)		**0.15**				
Discussions improve understanding and knowledge attainment by sharing knowledge, ideas, opinions, views, etc. not availed by lectures.	C	31.0	34.7	38.9	28.9	40.7
Gives an opportunity for discussions and development of ideas.	C					3.70

APPENDIX 7b continued: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Tutorials are good for expressing ideas and answering questions without digressing from the main topic.	C			1.85		
It gives you a chance to listen to others' viewpoints and then decide what you agree with yourself.	C				5.26	
Easier to retain and remember what one hears from and argues out with friends.	C	2.70	4.08	7.40	2.63	3.70
Group work provides opportunity for comparison and evaluation of self and others.	C	2.70	5.10	1.85		3.70
Group work allows students to share their strengths and weaknesses.	C		0.51		2.63	1.85
Group work allows for constructive criticism of peers.	C				2.63	
It is good to work together to solve problems.	C	2.22				
Group work makes the work easier.	C	1.92				
Group work has been proven to work.	C		0.51			
It is easier to learn from one's peers than from a blackboard.	C				2.63	
Gives one a chance to get clarification from lecturers/students.	C	1.62	3.06			
This system is already in place (labs, tutorials, etc.), and it works.	C	1.62				
Group work makes the work more interesting, motivating and rewarding.	C	1.62	3.57			3.70
Group work gives opportunity to discover others' different ways of learning and approaches to problems.	C	1.48	2.04		2.63	1.85
Things might be better understood presented in a different way.	C		2.55			
Students would be able to discuss problem areas and misunderstandings where lecture notes are concerned.	C		0.51	1.85		
Lecturers provide skeletal information, so students should work together to beef this up.	C		0.51			
It is good to work together to solve problems.	C		0.51			
Gives students the ability to ask questions or bounce ideas off each other and learn in a much more relaxed atmosphere.	C	1.33	1.02		2.63	
Working together brings the class together because of the friendly atmosphere.	C		0.51			1.85
The more the people one works with, the less they feel isolated in making mistakes as everyone makes mistakes.	C					1.85
Easier to work in one's own time and space, with knowledge that fellow students and lecturers would be there if needed.	C	1.33				
Learning this way is more effective as students are actively involved and interactive.	C	1.33	0.51			
It provides a forum for challenges to one's thinking, and for one to challenge others, thereby stimulating further thought.	C		0.51			
Helps identify and iron out misconceptions, errors or doubts.	C	1.18	1.53	1.85	2.63	1.85
Helps identify areas where more study is needed.	C			1.85		
It would help students learn from their mistakes.	C			1.85		1.85
Students have differing capabilities of understanding in class, hence can help each other out after.	C	1.18	5.10	1.85	7.89	1.85
Fellow students might know something you don't.	C			1.85		1.85
Group work is helpful/beneficial.	C	1.03				
Working together trains students on skills of communication and co-operation, and fosters interpersonal relationships, skills needed for fitting into the society and jobs.	C	0.74	3.06		2.63	1.85

APPENDIX 7b continued: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lecture notes. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
This develops the skills of interpretation, analysis, critical thought, etc.	C		0.51			
Group work allows for coverage of those issues not covered in lectures.	C				2.63	
Helps students think about issues more, therefore improves learning.	C	0.74		3.70		3.70
Students should be responsible for their own work.	C	0.59				
One often learns more if finding things out for themselves.	C	0.59				
Information overlooked during one's revision could be covered with the help from other students and lecturers.	C	0.59	2.04		7.89	3.70
Discussions help stimulate one's views and thoughts.	C	0.44	0.51			
Conflicting views stimulate thinking.	C				2.63	
Talking through a subject opens it up to further study.	C				2.63	
Feedback from other students is essential.	C	0.44				
Explaining to others helps one gauge their level of understanding and knowledge.	C	0.44			2.63	
Gives one the opportunity to see if they are on the right track.	C	0.44				
Biology would be easier to learn if there were more tutorials like in other subjects.	C	0.44				
Requires a lot of self-guidance, self-discipline and hard work but improves understanding, therefore enhances learning.	C	0.44				
Smaller group work helpful as class sizes are too big, less embarrassing.	C	0.44				
Encourages independence and other skills necessary in real world where nothing is presented on a plate.	C	0.30				
It helps to talk about the course and help each other out.	C			1.85		
People always need help from others.	C	0.30				
Others can sometimes explain things in a simpler way.	C	0.30		1.85		3.70
This is already true, and lecturers do answer questions when needed.	C	0.30				
Helps students to discuss issues and come to their own conclusions.	C	0.30				
Some students can't work alone, therefore find group work helpful for studying.	C	0.30				
Gives students an opportunity to ask questions where they didn't understand.	C	0.30				
Students have their own unique way of learning, so they can help each other.	C	0.30				
Students would help each other with difficult topics.	C		2.55	5.56		
Help is always good.	C	0.15				
Being part of a team helps a lot.	C		0.51			
Good to hear others views, even if they may contradict yours.	C	0.15				
It gives an opportunity to listen to conflicting views, which is essential in learning.	C					1.85
Working with others is more practical as students spend more time with each other than with lecturers.	C	0.15				
Some people work better under different circumstances.	C	0.15				
If students were told what might be expected of them, they would achieve far more from reading books and taking notes.	C	0.15				

APPENDIX 7b continued: Glasgow University Comment Categories – Part 2 Question 2

Q2: Students could improve their learning if they worked more with their fellow students and not just confine themselves to lectures notes. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Gives students a chance to debate issues with fellow students.	C	0.15				
Gives one the opportunity to defend their views and hear others'.	C	0.15				
Discussions help in 'rehearsal' of information otherwise not understood in books.	C	0.15				
Not always easy to grasp and understand concepts in books.	C	0.15				
Though people work at different rates and in different ways, it is necessary to meet with students and staff to make sure one is on the right track.	C	0.15				
Students work better in a related environment (?)	C	0.15				
Students work better when under no pressure and are independent.	C	0.15				
Solving problems is much easier in small group situations.	C	0.15				
Students would find it easier to tackle essay questions from their independent learning.	C	0.15				
Allows students to have individual attention from lecturers.	C	0.15				
They should not rely totally on books.	C	0.15				
Excessive interference from lecturers and other staff decreases interest and might lead to resentment.	C	0.15				
Group work helps improve one's confidence in speaking.	C	0.15				
Getting views from others improves one's confidence.	C		0.51			
Helps in the development of individuals' ideas.	C	0.15				
Results produced by group work reflect interest and not just rote learning.	C	0.15				
Saves valuable time as others could quickly explain things to one, rather than working on something for ages without understanding.	C		0.51			
One can learn better explaining to others.	C		1.02		7.89	5.56
Group work allows for independence from lecturer, therefore a greater input into the subject by students.	C		0.51			
This is an ideal way of learning.	C	0.15				
I liked First Year because of group work, even though I didn't have confidence to argue and speak out. Second year tutorials were good but not enough.	C			1.85		
This would work if it was voluntary on behalf of both **(Question misconstrued)**			0.51			

APPENDIX 7c: Glasgow University Comment Categories – Part 2 Question 3

Q3: Learning by seeing connections between ideas is more effective than absorbing isolated facts. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 21**	**Level 3**	**Level 4**
Learning facts is easier	A	1.18	0.51	1.85		
Many exams are based on memorisation, so one has to do it. ***	A	0.15				
You can't go wrong when memorising, it works.	A	0.15				
One might end up making the wrong connections.	A				2.63	
Memorising helps, as sometimes understanding and seeing connections are not possible.	A	0.15				
Notes are too disorganised to make seeing connections possible.	A		0.51			
It is not necessary to see connections all the time, sometimes they could complicate things or lead to confusion.	A/B	0.74				
Making connections is a skill that is acquired over time. Memorising may be okay for the first two years, but not for honours courses.	A/B	0.15				
It depends on the individual, people have different ways of learning.	B	1.48	1.02	1.85	2.63	
Both methods are equally effective, depends on topic or assessment format.	B	1.18	1.02	1.85	2.63	11.9
One needs to employ both methods.	B	0.89	0.51			
Connections are good, but one needs to know the facts before connecting ideas.	B/C	1.92				
Memorising isolated facts is fine, but one has to know what they mean by making connections.	B/C		0.51			
Connections help to remember information for a longer time, however memorising is good for immediate tests.	B/C			1.85		
Learning factual information might be easier, but connections help achieve better understanding.	B/C	0.74				
Making connections is a good way of learning even though it requires a lot of work and thinking.	B/C	0.59				
Even though seeing connections might be good in the end, it is often confusing.	B/C				2.63	
Biology seems to have fewer patterns and connections than other subjects., though it would be easier to learn it if one learnt to see them.	B/C	0.15				
Although memorising facts might ensure a reasonable pass, a good pass can be obtained by seeing connections.	B/C	0.15				
Even though I have a good memory, connections could help.	B/C					1.85
It is easier to remember and not easy to forget ideas that are logically connected since there are less things to remember.	C	27.6	28.1	24.1	34.2	27.8
We remember things by association.	C					3.70
Logical connections between ideas ensure and demonstrate more effective understanding, learning and knowledge attainment than simple memorisation.	C	21.9	16.8	33.3	26.3	14.8
One can easily get confused when memorising, while understanding makes learning easier and better.	C	10.6	8.16	13.0	10.5	7.41
One can be able to build the entire picture and relate things to one another, or relate things that re known to those unknown.	C	4.73	6.63	7.41	2.63	11.9
Connecting ideas makes learning much more interesting, while isolated facts are boring.	C	3.55	2.55	7.41	2.63	3.70
Making connections allows demonstration of creative thinking, critical analysis, interpretation, reasoning, application etc.	C	2.51	4.08	1.85	7.89	7.41
Making connections teaches students to think in a problem-solving way.	C			1.85		
There are too many isolated facts, therefore too much to memorise, hence too much for the brain.	C	2.22	0.51	3.70	2.63	

APPENDIX 7c continued: Glasgow University Comment Categories – Part 2 Question 3

Q3: Learning by seeing connections between ideas is more effective than absorbing isolated facts. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
Having an idea of how things connect, one would be in a position to explain the origin of the ideas and how things work logically, with competence.	C	1.77	1.02	1.85		1.85
If ideas are connected, answers can be worked out through deduction, not just by memorisation.	C	1.62	2.04			
Connections allow networking of information in the brain, therefore easier storage.	C	1.48				3.70
Science (biology) is made up of connecting issues.	C	1.18	1.02			1.85
I just know that making connections works (this is obvious).	C	1.03	2.55			
Simple facts on their own are useless and don't mean anything, connected issues are easier to use.	C	0.89	2.55			1.85
Connections encourage a higher level of thinking about issues.	C	0.89	0.51		2.63	
Connections allow for better structure in writing essays and in exams as ideas flow.	C	0.89	1.53		2.63	5.56
Information learnt in connections makes more sense than isolated facts.	C	0.59	1.02	3.71		1.85
Connections between issues in a topic helps one 'rethink' the topic every time they look at the different issues.	C	0.44				
Connecting ideas is the right and best approach to learning.	C	0.44				
Facts change constantly in science, so one needs a sound framework of ideas and theories.	C	0.44				
Facts are never isolated, one small part is a piece of a bigger whole.	C	0.30	1.02			
Understanding concepts leads to better performance in exams than memorisation.	C	0.30				
Not everything can be memorised, so one needs to learn to connect ideas.	C	0.30				
Memorising isolated facts doesn't show understanding or intelligence.	C	0.15				
It allows you to link different topics, so learning is linked together over many topics.	C	0.15				
Understanding how ideas relate allows for comparing them easily when one is required to.	C	0.15				
One can be able to build mnemonics form the connections to aid memory.	C	0.15				
The connections between the ideas give different points of view which help to put the information in context.	C	0.15				
This opens the mind to other/more ideas.	C		0.51			
This gives on various ways of approaching a problem, or arriving at an answer.	C		1.02			1.85
In the work place, one will not be asked to state what they know, but rather how they can use this knowledge to solve problems.	C	0.15	0.51		2.63	
Isolated facts cannot be used to understand linked situations, but just to answer specific questions.	C	0.15				
Making connections forms a good foundation for future learning.	C	0.15				
By just memorising isolated facts you can't appreciate the connections between facts.	C	0.15				
Connections help categorise information.	C	0.15				
Memorisation does not encourage scientific thinking, while making connections does.	C	0.15				
Seeing connections allows for processing information at a deeper level.	C	0.15				
Exams questions usually demand use of connected issues than solitary facts.	C	0.15				
Connections give you the main ideas, which are easier to expand on.	C	0.15	0.51			

APPENDIX 7c continued: Glasgow University Comment Categories – Part 2 Questions 3

Q3: Learning by seeing connections between ideas is more effective than absorbing isolated facts. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
One needs to make relationships between ideas in order to understand differences.	C	0.15				
Connections help one answer abstract exam questions.	C	0.15				
Exam questions might not be straight forward, so one needs to understand.	C		1.02			
Seeing connections helps thought processes in answering exam questions.	C		0.51			1.85
Connections allow one to explain things in their own way, and not just reproduce isolated facts.	C	0.15				
What one learns then becomes personalised through own ways of connecting the issues.	C					1.85
This works, as long as the connections are clear.	C		0.51			
Short questions demanding right answers to proposed facts do not assess one's understanding of concepts.	C		0.51			
Exams are not worth doing if they test on memorised facts where an 'exact' answer is expected.	C			1.85		
Mechanisms are more important for working out the facts.	C		1.02			
Looking for connections is more of a challenge than memorising.	C		0.51			
What one sees or hears sticks better in the mind than hearsay **(Question misconstrued).**		0.74	1.53			3.70
Lectures involving seeing things e.g. slide shows, are more interesting **(Question misconstrued)**			0.51			
Having done something in practice makes it easier to work on. **(Question misconstrued).**		0.44				
Labs are good because one gets to see things for themselves. **(Question misconstrued)**		0.33				

APPENDIX 7d: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, they are there to guide them in their learning. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Lecturers have to do both guiding and supplying information.	A	2.22	0.51	1.85	2.63	1.85
Lecturers should supply students with all the necessary material and help.	A	1.33	0.51			
Lecturers should not just give out information and expect students to go to advisors etc. for help (this is what they do often), they should help them themselves.	A			1.85		
Lecturers are the ones with the greatest depth of knowledge and are there to teach us.	A	0.44				
Lecturers must supply students with material on which they will be tested or examined.	A	0.44			2.63	
All testable information should be given to ensure everyone is learning the same material.	A	0.30				
More time should be spent on teaching so that everyone reaches the same level.	A		0.51			
Lecturers have a responsibility to teach effectively.	A	0.30				
Lecturers should supply as much information as students can be content with.	A	0.15				
It is helpful to be taught and inspired by someone else.	A	0.15				
It is the lecturer's job to help students in any way possible.	A	0.15	0.51			
It is their job to tell us what to learn and what is needed to pass with an 'A' grade, and they are paid for it, so they should do it.	A	0.15				1.85
Lecturers should pass on what they have learnt to students.	A	0.15				
Lecturers should be there to teach something which students do not know.	A	0.15				
Lecturers should be very specific on the curriculum and tell you what you need to know exactly.	A	0.15				
Lecturers' notes alone should let you pass.	A	0.15				
Only lecturers know what's to be covered, so they should supply it.	A	0.15	0.51			
Lecturers specifically said all we need to know to pass exams comes from lectures. ***	A	0.15				
The point of attending lectures is to learn the necessary information, and lecturers should be there to supply it.	A	0.15				
Lecturers should not be lazy.	A		0.51			
If course content is not detailed, students can be misled in discussion or personal study.	A/B				2.63	
Students would waste time learning irrelevant facts if they didn't know exactly what they are meant to learn.	A/B	0.59				
It is easier to learn when supplied with all the material. One would otherwise learn the wrong things.	A/B	0.15				
As well as providing facts, they could also help them to learn in better ways.	A/**B**	0.15				
Some teaching is essential because you must identify the truth from what isn't.	A/B	0.15				
Lecturers should help students whenever they can, and if it means giving all the information they need then that should happen.	A/B	0.15				
Lecturers should give the majority of the information needed, or as much as possible.	A/B	1.03				
Students may have conflicting views.	A/**B**			1.85		
During lectures, there should be proper teaching because lectures are the core of the learning process, though they shouldn't necessarily teach everything.	A/**B**		0.51			

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Even though it might not be possible to give students as much information as possible, lecturers should aim for this in the early years at University.	B		0.51			
Lecturers should not only inform students what to take from lectures, but also where to get own extra information.	B			1.85		
Lecturers should guide students, but they should also make students aware if what they are telling is only a side of the story.	B					1.85
Even though students should do independent work, lectures should make sure them give them a lot of relevant information and references, and make sure they understand.	B	1.77	2.55	1.85		
The majority of information should be covered in lectures.	B			1.85		
Lecturers should give the majority of the information and guide students to extra.	B					1.85
Lecturers should guide students as to where they might best find information (books and references) and how best to use them.	B		3.06			
Lecturers should highlight the important points in a course and supply the students with the relevant page references.	B		0.51			
They give page numbers to study, etc., so they do in a way help guide to learn ***	B	0.15				
Lecturers give students limited information, but also page references to textbooks to guide students. ***	B		0.51			
In later stages of the course there would be too much information for lecturers to cover in class, so independent learning would be emphasised.	B				2.63	
Guiding should only start after First Year.	B	0.59				
Lecturers should give the bulk of the information; students should do the little left on their own.	B	0.59	0.51			
Lecturers should supply all information; it is up to the student if they want to do further work.	B	0.59				
If lecturers were to just guide students, it would be difficult for students to know how much more to learn outside lecture notes.	B	0.44				
Lecturers should tell students where information could be found. Sometimes there is just so much that students don't know where to start.	B	0.44				
Lecturers should provide a strong base for learning and not just expect students to find everything for themselves.	B	0.44				
If not pointed in the right direction, students might learn the wrong things.	B		1.02			1.85
Even briefly mentioning every topic is helpful.	B	0.30				
That may be the case as long as the course material is accurate.	B	0.15				
If something comes up in an exam and the lecturer hasn't taught it that's unfair.	B	0.15				
Lecturers should be aware of the students' other courses. Even though they shouldn't spoon-feed them, they should tell them what is required of them.	B	0.15				
Lecturers should supply all the information, students have too much work to do to find time to do further studying on their own.	B	0.15				
I agree with the statement, but for exam purposes, all students should have equal advantages, which should come from lectures.	B	0.15				
This penalises students who lack access to the resources (internet, etc.) in private time.	B	0.15				
Exams would be unfair, as some people might not have had the privilege to find the information while others might have.	B			1.85		
Even though students should be guided instead of being given all information, it would be unfair for other students to get marks for having read a specific paper that others might not have seen.	B					1.85

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: lecturers are not there to give students all the information they need, but they are there to guide them in their learning. COMMENT	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Lecturers should put set 'boundaries' of where the students' study time should be aimed. In recent exams I felt I knew 'too much' in one area and other questions I was totally under-prepared for.	B	0.15				
They have to tell you what to learn, otherwise you either learn too much or too little, depending on sources used.	B		0.51			
Lecturers should be around more and tell students what information to look up so that they won't cover irrelevant material and end up failing exams.	B			1.85		
It is always useful to get extra information yourself, but usually, lecturers provide all the information needed. ***	B	0.15				
This is true, but often tests (at Level 2 anyway) only need knowledge of lecture material to get an 'A' grade. ***	B		0.51			
There is way too much information on each topic out there, so students need to be given specific instructions to take in their study.	B		0.51	1.85		
It is possible to get lost in a sea of literature. Guidance from someone who knows his or her stuff helps eliminate time wasting.	B					1.85
Lecturers should provide a guide to what students should be reading and revising in the books. It cuts out much of the jargon.	B		0.51			
There should be guidance, plus more directed reading.	B				2.63	
They should be there to suggest where to find additional information on a topic.	B			1.85		
The lecturer should supply technique and support.	B	0.15				
They should offer tips on how to learn things.	B			1.85		
Lecturers should help students with where to find information and in the selection of the best sources.	B	0.15			2.63	
More help should be offered.	B			1.85		
Lecturers can't say something once and expect the students to remember it, if they can help with how to go about finding information it can help.	B			1.85		
Lecturers are educated people and know effective ways to study and learn. A good lecturer would be willing to pass this knowledge on to students to help them do the same.	B		0.51			
Lecturers have themselves set exams at one point, and that makes their comments on learning and revision quite valuable.	B				2.63	
Most of the information should be given to give a good indication of what one needs to know.	B		0.51			
Lecturers should teach difficult topics.	B	0.15				
Students rely on lecturers to tell them how to manage with the course and for advice.	B	0.15				
Lecturers should tell students **everything** they need to know, and students should then study it in more detail.	B		0.51			
They should either give them the information, or give them guidelines as to where to find it.	B		0.51	1.85		
They should give them all of the most important information and tell them where to find more.	B			5.56		
Lecturers should provide most of the information and where to find out anything else.	B	0.15				
Lecturers should provide all the information necessary, but should also stimulate students' thinking.	B	0.30				
Lecturers should provide a **concise overview** of the subject.	B				2.63	
Lecturers should guide, but also put forward all information needed to pass exams.	B		1.02			

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Lectures should give students the basics, but give them the information that they should know for the exams.	B		1.02			
All the information needed for exams should be given, but one needs to process it before spilling it out again.	B		0.51			
Lecturers should give all the information for class tests and exams, but not for essays and take home assignments.	B		0.51	1.85		
Lecturers should make sure all students are guided in the right direction for exam questions.	B				2.63	
Students should learn from lecturers because books have no enthusiasm, while lecturers (sometimes) do.	B		0.51			
Lecturers need to give sufficient information so students can do their work. Some don't give enough.	B			1.85		
Some lecturers don't guide students well.	B				2.63	
It is up to the student if they want to do further work or not.	B	0.15	1.53			
It helps you to learn more, but lecturers SHOULD give the majority of the material needed.	B/C			1.85		
This is okay as long as students have guidelines to show how much work they have to do and where to stop.	B/C		0.51			
This is ideal, but I don't think the correct amount of guidance is given.	B/C		0.51			
Even though students need to research their information to a certain extent, they still need guidance on what to concentrate on.	B/C					1.85
Lecturers are supposed to give students coherent overviews of the topic in hand, not simply give some 'spiel' that was found in a text book earlier that day. This could be enriched with further appropriate material.	B/C					3.70
Lecturers are not there to give all the information, but should do a good job of guiding the students, so students know what to learn.	B/C	1.03				
Students need to be given just the main bits of the syllabus so that they can study correctly.	B/C	1.48	1.02			
Lecturers should provide more than just a guide, but should not feed students all the information, but to encourage them to find their own information.	B/C	0.30				
Lecturers are students' link with information and students rely on them **partly** for guidance.	B/C				2.63	
Students should learn to teach themselves, however some lecturers do not even make the basic information clear enough.	B/C	0.15				
They should give students clear instructions as to what else students need if it's not in lectures.	B/C		0.51			
They should just let students know exactly what they should learn but leave them to do it themselves.	B/C	0.89				
Lecturers should tell students where to find information not covered in lectures.	B/C			1.85		
If further knowledge is going to be examined, further reference should be made as to where it can be found.	B/C			1.85		
Hints on further reading and information are helpful.	B/C	0.15			2.63	
They should guide, but also indicate whatever further learning is also required.	B/C		0.51			
They should provide the basics, but then give limits on further reading.	B/C		0.51			
Lecturers should give the basic information but also indicate related areas of interest.	B/C	0.15				
You mostly learn what the lecturers tell you, but they guide you to go deeper into the subject.	B/C		0.51			
Lecturers should give most of the information, but students have to read further to get other views and further their knowledge.	B/C	0.74				
Students should be encouraged to take the work further, but it would be unfair to test on work not properly explained.	B/C			1.85		

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
They should guide but provide a sound foundation for private study though.	B/C		1.02			
Lecturers should provide the most important information, but it is up to the individual to learn about it in more detail.	B/C	1.03	2.04			
Lecturers should provide all information for a basic pass, but should encourage students to evaluate the knowledge and expand it.	B/C		1.02			
At university students should get further information from books, etc., but lecturers should give enough information to pass.	B/C	0.15				
Lecturers should give all information necessary for exams, but also guide students towards things, which can improve the depth of their knowledge.	B/C			1.85		
Lecturers should provide students with enough information to pass exams, but also tell students where to find extra information, which is not necessary for exams, so that if they are interested, they can look for it.	B/C	0.44				
Lecturers should give students all information which will be examinable, but encourage further study by questioning in lectures, take home tests, etc.	B/C			1.85		
Lecturers should provide the necessary information to pass the course, but to excel in it you should have to do extra work.	B/C					1.85
Lecturers should cover all the topics needed to pass exams. Students' understanding is relative to the amount of independent study they do.	B/C	1.03	2.04			
Although exams should only be based on lectures, reference to books would present the information in another way, which make it clearer.	B/C	0.59				
The lecturers should teach what they need, but provide extra information to allow students to form their own opinion.	B/C	0.15				
Lecturers do give you a lot of information, but they almost always will show you where to get more detailed information. ***	B/C	0.15				
If lecturers gave a good background to the subject and references, this should be enough. A tutorial should then be given to confirm understanding.	C					1.85
Lecturers should and only just provide the skeleton and leave students to beef it up.	C	11.7	7.65	5.56		7.41
Lecturers should indicate what should be looked at but not necessarily go into detail.	C		0.51		2.63	
Some points are not covered in enough detail in lectures, so they need to be supplemented by other knowledge.	C	0.15				
Lecturers should highlight important issues and current research, leaving facts to be learnt from textbooks.	C	0.44				
Lecturers should give the main/important points with reference material for students to do further research on the topic.	C					3.70
Lecturers help students understand what's taught by giving them examples from history and everyday life.	C	0.15				
They are there to help if students don't understand in lectures.	C			1.85		
Information often needs to be explained and understood, so that is what lecturers are there to help students with.	C	0.30				
The textbook is where most of the course information should be found. ***	C	0.74				
It is impossible to provide all the information during lectures.	C	11.4	8.67	7.41	10.5	5.56
Students just need a good course outline to follow.	C			1.85		
Students must also make an effort to learn on their own, otherwise they would be useless.	C	6.79	1.53			
Students should also learn how to do independent research work.	C	1.77	0.51			

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
Students should be able to develop their own learning and study techniques.	C	0.15				
Independent working results in better understanding and learning and stimulates broader thinking (broadens minds).	C	5.02	7.14	1.85	2.63	1.85
Finding more information independently expands knowledge.	C					1.85
Students have to show some initiative themselves.	C				2.63	
One often has to consult books and other sources for additional information.	C	3.84	2.04			
To ensure objective learning, different types of sources are needed, including lectures.	C				2.63	
A goof lecturer is someone who stimulates desire for greater knowledge and enthusiasm for the subject.	C				2.63	
It is useful for students to get different points of views from books and other lecturers.	C				2.63	
There are many different points of view in science and in order to be a good scientist one needs to form arguments for/against, and evaluate them.	C					1.85
Lecturers should encourage students to read certain texts and look at other ways of approaching problems/concepts.	C				7.89	
Lecturers should motivate students into further reading.	C	2.36	2.55	1.85		
Students should be encouraged to be independent and find out some facts for themselves.	C	0.44				
Lecturers are there to stimulate students into thinking for themselves.	C					3.70
Lecturers are there to help provide the bridge between being taught to learning for oneself.	C					1.85
Students should be encouraged to think of wider issues.	C	0.15				
Students are obliged to conduct independent study and research as a follow up on what was taught and get more detailed information and different views.	C	1.92	2.04			
They should help them with problems, but should mainly point them in the right direction.	C	1.48	0.51		2.63	3.70
Information sought independently is easier to remember and not easy to forget.	C	1.18				1.85
It's the students who want to learn and are going to sit the exams, so they should do the work themselves with the lecturers' help.	C	0.89	0.51			
It is up to the individuals to find and read about what the lecturers indicate in class, i.e. to take responsibility for their own learning.	C	1.62	0.51	1.85		
Students should show their own initiative.	C					1.85
Lecturers tell the students the facts and get then to think about subjects, but the onus is on the students to do further work for more understanding.	C	0.15				
They guide us in the right direction, but it is up to the student to take the responsibility.	C		2.04			
Students must learn to think on their own and not just parrot what the lecturer or textbook says.	C	0.74	1.02			
Independent work makes the work more interesting and motivating.	C	0.74				
After graduation, one would have to know how to learn and think not how to recite facts.	C		1.53	3.70	2.63	
Independent learners make better researchers in the future.	C	0.15				
Students need to learn research skills needed after university.	C					1.85
Students should be encouraged to do outside reading because understanding more will give them an advantage in the future.	C			1.85		

APPENDIX 7d continued: Glasgow University Comment categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
This prepares students for the future (decision making, etc.)	C	0.59	1.02			1.85
Science as a career is not only about how intelligent you are. It requires thought and the ability to learn outwith acquired knowledge.	C					1.85
Information is continuously changing, so students need to keep themselves informed all the time and be able to learn to think critically on their own.	C	0.44				3.70
It is not school, so students have to think for themselves.	C	0.15	0.51			
Unlike at school, students at university are able to look some things up themselves.	C					1.85
Lecturers lecture, teachers teach.	C	0.15				
This is what university is all about.	C	0.44	0.51			
Part of university is learning to learn, not just learning facts. One can never learn later on if they don't know how to.	C					1.85
University students are old enough to do independent research.	C	0.89				
At this stage students should be able to find information for themselves quite easily and shouldn't depend too much on lecturers. Lecturers have other stuff to do.	C					5.56
Learning has to be self-driven and is not about being spoon-fed.	C					1.85
Spoon-feeding is not necessary at university.	C	0.59	1.02			
Spoon-feeding doesn't awaken the desire to explore the unknown.	C				2.63	
Spoon-feeding does not lead to learning.	C				2.63	
Although lecturers shouldn't spoon-feed students, they should be approachable enough after lectures for students to ask then questions.	C		0.51			
There is more to courses than what lecturers present.	C	0.30				1.85
Although lecturers can't provide everything, if a student has tried to work on something alone and still can't understand, they have to help them.	C	0.30	0.51			
Students should learn how to look for information themselves because employers will expect this of them.	C	0.30				
Lecturers lecture to too many students everyday to be expected to make sure every student knows everything they will need to know.	C	0.30				
Lecturers are to point students in the right direction without forcing too strong opinions of their own on them.	C					
Lecturers just point out potential problem areas, and students are expected to do additional learning independently.	C	0.15			2.63	
This makes students to do revision in their own time.	C	0.15				
This encourages students to find more information in their own time.	C			1.85		
This encourages hard working in students.	C	0.30	0.51			
This makes it easy to separate hard workers from lazy ones.	C	0.15				
There is a lot of information (e.g. from labs) that needs background reading to fully understand, not just lecture notes.	C	0.30				
Lecturers should not just be personified textbooks or encyclopaedias. If they were, no one would attend lectures.	C	0.30				
Reading up round the subject is important.	C	0.30	0.51			

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	Level 1	Level 2e	Level 21	Level 3	Level 4
Lecturers are there to help, not to lead you.	C	0.30				
If everyone were led by the hand, no research would ever be undertaken.	C		0.51			
Once you have lecture notes, you can then expand on them.	C	0.30				
It encourages the students to read around a subject and develop a greater interest.	C	0.15	0.51			
Conducting own research makes the work more interesting and enjoyable.	C		0.51		2.63	
Lecturers might leave things out or cover things one doesn't find interesting or important.	C?				2.63	
Lecturers should let students examine topics to see what they find most interesting for further study.	C	0.15				
Giving references allows further reading if the student shows willingness to pursue interests.	C					1.85
Students can then learn in detail what interests them.	C					1.85
Handing out information will not develop either interest or problem-solving skills/thinking skills in students.	C	0.15				
If interested, students will look for more information.	C	0.15				
Doing their own background work helps get students more involved in their work.	C	0.15				
Students have to learn to be actively involved in their learning.	C	0.15				
Some of the stuff in exams is not in the notes, so it is necessary to do further studying.	C	0.15				
Guiding students allows students to know what to study in more depth.	C	0.15				
Lecturers are just there to make sure students go the right way.	C	0.74				
Lecturers shouldn't provide all the information, but just point the students in the general direction and let them discover more.	C		0.51			
Lecturers should encourage and ensure basic understanding, but not be expected to just hand over information.	C					1.85
Guidance helps in learning the facts.	C	0.15				
Allowing students to see all the resources available gives them a sense of independence.	C	0.30				
Students need to be independent in their ability to teach themselves.	C		0.51			
Students have to find information for themselves.	C			1.85		
Guidance helps in study but also leaves room for the student to work independently.	C	0.15				
If not given the opportunity to work independently, students would end up being dull and lazy.	C	0.30				
It is better to learn the basics and them expand on them independently.	C	0.15				
A good student will always go and do independent work after lectures.	C	0.15				
Students should be interested and want to find out more.	C			3.70		
It is better for students to learn at their own pace.	C	0.15				1.85
It's good to make us do research ourselves, it will help us to be more imaginative.	C	0.15				
This encourages independent thinking in students.	C		0.51		2.63	

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
Most students are too lazy to do extra reading, so lecturers should just provide very basic information to encourage them to read further.	C	0.15				
A lecturer might not be able to find all the necessary material or might not know everything, or even make mistakes, so students should research.	C	0.15				
Lecturers are not infallible.	C	0.15				
I don't always agree with the lecturer's view anyway, but may need some guidance.	C					1.85
If not given the opportunity to work independently, students would not be able to study on their own.	C	0.30				
Students are more likely to form their own opinions about topics if they work independently.	C	0.15				
This allows students to decide on their own beliefs, opinions, views, etc.	C		0.51			
Students should not rely only on lecturers' views, they should give theirs as well.	C	0.44				
Part of the skills of being a scientist is to form one's own ideas and guiding students gives them good practice for this.	C	0.15				
It is important to develop own opinions.	C					1.85
Most students enjoy the challenge of having to find information for themselves.	C	0.15	0.51			
Sometimes lectures are not necessary.	C	0.15				
Background reading is always beneficial, as one might have missed things in lectures.	C		0.51			
Giving students 'lumps' of information is not teaching, but an encouragement for them to just memorise things.	C		0.51			
It would be impossible to write a good essay from the lecture notes.	C		0.51			
Through independent learning, one learns different ways of presenting topics.	C		0.51			
You can't just rely on the lecturer.	C			1.85		
It is good to get guidance about interesting books which could be read for the sake of interest, and not just for exams.	C			1.85		
This would give students a chance to judge and evaluate scientific facts themselves.	C	0.15				
Learning is to enable the individual to work effectively and creatively, to take the gained knowledge further.	C		0.51			
It would not do the subject justice if the only information you were required to learn was in the lectures.	C	0.15				
This is the way things should be.	C	0.15				
I f you can't think for yourself you will discover nothing.	C	0.15				
Students have to figure things out for themselves.	C			1.85		
This is good because it wipes away the fear of expanding your mind and seeking knowledge for yourself.	C				2.63	
If lecturers gave all the information, lectures would take too long and people would stop paying attention.	C					1.85
Lecturers should clearly state the aims and objectives of lectures, but at the same time encourage them to look for further material.	C				2.63	
Students will vary in what they want to learn, but there should be a basic syllabus.	C?	0.30				
This is true, lecturers are the only people to guide students. (**A – Question misconstrued**)						1.85

APPENDIX 7d continued: Glasgow University Comment Categories – Part 2 Question 4

Q4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. COMMENT	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
If a student approaches a lecturer and asks specifically for certain information, it would be rude for the lecturer to refuse. (**Question misconstrued)**		0.15				
Students can choose what subjects they are most interested in to explore them further. **(C- or Question misconstrued)**		0.15				
Students need the lecture notes, once they have lecture notes; they can expand on them. **(C – Question misconstrued)**			0.51			
Disagree without comment	A	0.59	0.51	3.70	0.00	0.00
Neither agree nor disagree - without comment	B	2.66	5.61	3.70	5.26	1.85
Agree without comment	C	6.65	13.8	5.56	13.2	9.26

APPENDIX 7e: Glasgow University Comment Categories – Part2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
It is ridiculous to test on what was not taught or talked about. Lecturers have more influence than course information documents, etc.	A		0.51			
To introduce such a concept of examining beyond lecture material would be ridiculous and self-destructive.	A	0.59				
In practice, students study, understand and have knowledge only on what they are taught or told to study.	A	0.44	1.02			
Students cannot be expected to learn things they haven't been told.	A	0.15				
Students expect to be examined on what they know/are taught.	A	0.15				
Only what was taught should be examined.	A	0.44				
Students should know exactly what they are expected to reproduce in exams.	A	0.30				
Students want to pass exams, and should know what they are going to be tested on.	A			1.85		
Exams should be based on what was taught, and students should be told what they need to know.	A		0.51			
If stuff is not taught in class, students would not know if they need to know it.	A		0.51			
Everything needed for the exams should be taught.	A	0.30				
Students should be told what they are going to be examined on.	A	0.15				
Students need to know what areas they are going to be examined on.	A			1.85		
Students would otherwise never know what will be in the exams.	A			1.85		
If something that was not mentioned in class appeared in exams, there would be no point in doing this as students would not know anything about it.	A	0.30				
Students can't be examined on things they don't know.	A	0.15				
Students only learn the basics and will not search for extra information.	A	0.15				
There are set marking schemes that do not include any extra knowledge, so learning this would be a complete waste of time. ***	A	0.15				
When marking exams, lecturers love to read what they have taught, so this is important. ***	A		0.51			
There is not point in having a textbook if all you need is in your notes. ***	A	0.15				
Students should be able to learn enough from lectures without having to learn anymore.	A	0.15				
There is no point in teaching students if what is taught is not detailed enough to use in exams.	A	0.15				
Exams are scary enough as it is, some people suffer from 'black-outs' even though they know their stuff.	A	0.30				
If a student works very hard at what they have been taught, they should stand a chance of getting all the marks, instead of relying on luck on question requiring personal knowledge.	A	0.15				
The definition of exam is a test of what someone has been taught.	A	0.15				
Exams should be on basic knowledge that everyone knows. People cannot be examined on things they do not know.	A	0.15				
Exams should be based on taught information only, especially in Multiple-choice exams.	A		0.51			
Only what's taught is and can be tested as not everyone will read or find out related topics to the depth required.	A/B		0.51			
This gives everyone a fair chance of passing.	A/B	0.30				
All students should have a fair chance to pass.	A/B			3.70		

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
All students should stand a fair chance, even those who do not have extra knowledge.	A/B	0.15				
Exams should have a combination of both to allow students with different exam preferences to have an equal chance.	A/B	0.15				
All students should learn the same material.	A/B		0.51			
This would make sure students are not surprised by exam content.	A/B	0.44				
The presence of unknown material or that not taught in class would cause failure through panic.	A/B	0.44				
Exams should be based on lectures in 1st Year, perhaps would disagree in later years.	A/B	0.44				
It depends on what year the students are in.	A/B	0.15				
At 1st Year, you may not always be keen on all of your subjects, so I don't think you should be pushed to learn more about a subject you are not particularly interested in.	A/B	0.15				
Gaining additional knowledge on a subject might be useless, as one might not continue with the subject.	A/B	0.15				
If exams were not based only on what was taught, students would always be trying to provide more impressive knowledge than others.	A/B	0.15				
Things are hard enough as it is.	A/B	0.15				
It is unfair to expect pupils to have extra knowledge on a topic.	A/B	0.15				
Examining students on things not taught in class would be unfair.	A/B	0.15	1.53			
Basing exams on lectures is much fairer because there will be no questions on material not covered in the lectures.	A/B		0.51			
It is unfair to have exam questions on things that haven't been mentioned in lectures.	A/B			1.85		
It is unreasonable and unfair to expect otherwise.	A/B	0.89				
It is only fair to be tested on what was taught.	A/B	0.15				
It is only fair that questions in exams are based on what you know.	A/B		0.51			
The bulk of the exam should be on what has been **specifically** taught by the lecturer.	A/B	0.15				
You should gain extra marks for showing you have used the lecture notes, but also gain marks for showing understanding by explanations of topic and extra reading.	A/B		0.51			
General concepts should be taught before being examined, but specific examples should not be mentioned if they are not taught.	A/B				2.63	
It is unfair to test on things not taught or given reference to further study.	B		0.51			
As it is private study and wider knowledge is not tested, although questions should be limited to the course book. ***	B		0.51			
Examining students on information not taught or students guided towards would be pointless as they wouldn't know what would come up.	B		1.02			
Students would not know what they would be tested on or what to learn if not told.	B	4.28				
If exams were not based on lectures, students would not know what to study.	B		2.04			
If exams are based on anything other than what was taught students would not know what to read or learn.	B				2.63	
They should test on what is taught because then you know what to learn.	B	0.15				

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
It is easier to know what is going to be on the exams if it is only what has been taught.	B	0.15				
This is wrong if the extra knowledge is unattainable or students have no idea what it may be. Students should be directed to it with a hint as to what sorts and types of knowledge they will need.	B	0.15				
This would allow students to know what they would be tested on, otherwise they would overburden themselves with irrelevant material and fail.	B	1.18				
If exams were not based on lectures, students would not know how much more to learn, and might waste time learning irrelevant information.	B		3.57			
I agree mostly as it is unfair to expect everyone to understand extra reading, etc. in the same way they would be examined on it.	B					1.85
Unless the extra reading is specifically determined, then some students may be doing extra reading on different areas.	B					1.85
What students might end up studying could different from exam content, leading to failure, even though they did a lot of work.	B	0.89	1.02			
There has to be a plan of what students should learn.	B	0.15				
Students might not be able to find enough information to learn.	B	0.15				
Exams are limited in what they can ask on a subject in a given time period, so they should be based on what was taught only.	B		0.51			
There is too much material in lectures as it is, but not enough time.	B	2.95				
There are too many subjects and too much to learn in 2nd year to spend time learning more.	B		2.55			
Coursework is available for expansion of what has been taught, but it would be unfair to have to guess the content of the exam. Revision time-tables are strict enough even when you know what to learn.	B				2.63	
Exams should be heavily based on lecture material because there is too much information to learn everything for each subject.	B		0.51			
There is far too much information 'out there' for students to know what to learn.	B	1.03				
It is often hard to find information on topics of lectures, or there's no time to gather lots of extra information.	B				5.26	
It is not very fair to be examined on something you had no chance to learn. 'Outside of what is taught' is rather a large area.	B		0.51			
There is a huge amount of other reading that could done and it is unfair to expect students to know what to pick out and learn.	B		0.51			
It is helpful to know what to study for an exam as the amount of 'extra knowledge' can be overwhelming.	B	0.15				
Biology is too wide a subject for students to cover everything about it, and they would not know where to start.	B	0.30				
You never know what to learn because it's such a broad field.	B			3.70		
Students could end up confused.	B	0.15				
Students might get lost or not learn what is intended if left to themselves.	B				2.63	
Unless students were directed to learn certain information by themselves, they wouldn't know what would be in exams.	B			1.85		

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
If this were the case students would not know how much extra information to find.	B	1.03				
If exams are not based entirely on taught information, students would not be able to know how much and how diverse should their knowledge be.	B			3.70		
Students shouldn't get marked down on concepts not taught in lectures because they would not know the extent to which they should do background/extra reading.	B		0.51			
Unless a lecturer specifically specifies which books to read for further understanding, a student would have to read everything he/she could find on the off chance that a question on it comes up.	B			1.85		
This gives you an idea of what to study otherwise you'd end up trying to learn far too much and all the wrong things.	B			3.70		
If exams went beyond lectures, they could go to such depths that the students could never cover all the facts.	B		0.51			
Exams should be confined only to what was taught because students may be new to the subject and may not be aware of the extent of extra knowledge required.	B	0.15				
Most elements of exams should be this way to give a fair chance to all, as everyone learns differently with varying motivations. Exams asking questions of things unlearnt can be confusing, and not everyone would have known what to learn unless strict guidelines were given.	B		0.51			
Exams should be based on lectures to a certain extent, unless the lecturer has stated chapters in books to read, otherwise every student may learn something different from the other, leading to unfairness.	B		1.53			
Exams should be on lectures, unless students are told otherwise.	B			1.85		
Exams should be fair to all students. Not basing exams on lectures would be unfair as not all students would learn extra material, and even those who do would not learn the same extra material. Exams should show how hard students work.	B		1.02			
Exams shouldn't be based solely on lectures, lecturers have to tell students what chapters and page references to read in books so that everyone knows what topics they should read.	B		1.02			
Key points need to be underlined and students be directed in their learning, otherwise the assessment won't be appropriate.	B				2.63	
Students should be examined on what's taught or they are told to research independently, it's not fair to examine on anything available in all texts recommended or in the library.	B				2.63	
It can be misleading unless students are told to do extra reading on a subject. It would be unfair if they were not told to do so.	B	0.74				
Basing exams on lectures is only fair, unless a lecturer suggested extra material. Either way, the student should have an idea what is going to come up.	B			1.85		
Exams should stick to what's taught, unless otherwise stated.	B		0.51			
It would be unfair to ask students questions they are unprepared for.	B	0.74				
This would be unfair as not everyone will know the same things.	B			1.85		

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Different students could end up studying different things, so this could end up being an unfair exam as some might have been lucky to get the right information while some might not.	B	3.69	1.02			
You can't be sure everyone has the same opportunity to read the same background information, and therefore can't examine on it.	B				2.63	
Not every student would have learnt the same things or same amount of things.	B				10.5	
It is unfair to require additional knowledge from students for exams as they should all have the same fundamental learning to draw from.	B	0.15				
This would pose unfair disadvantage on those students without the resources that some have.	B	1.48	1.53			
Not everyone can get hold of books in time.	B		0.51			
This would be unfair because not every student can afford to spend time on extra biology study.	*B*	0.59				
Other students might not have time to learn other facts due to commitments from other subjects.	B	0.15				
Some students might not have had time to do their own 'research' giving them an unfair disadvantage.	B	0.15				
Sometimes people don't have time to read extra books, so they don't learn the extra information.	B			1.85		
It is not fair to examine students on things not taught as not all students have the same amount of time available for them to do extra reading from books, so they might not have done the same amount of extra research.	B		1.53			
Some people have not done as much biology as others, so their extra knowledge is limited.	B	1.03				
Some students might know things that others do not. It is unfair when this is displayed in exam papers.	B	0.44				
It is unfair to expect that everyone will have extra information.	B	0.15				
If exams are based on stuff outwith lectures, some students may not do any extra reading and therefore fail.	B			1.85		
There is so much extra information that could be learnt it is impossible to assume that all students have gone out and read everything else. Gives unfair disadvantage if students are expected to know material not mentioned in lectures.	B			1.85		
Although students should find extra knowledge, not all students do.	B	0.15				
Students should only find extra knowledge if it interests them. Therefore, different students will know more about different things.	B	0.44				
Any extra knowledge is unfair, some students are more keen on a particular subject than others.	B	0.15				
Lecturers should cover what has to be covered and tested. It is up to the students to do extra work if they want to.	B	0.30				
The expected knowledge should not deviate too much from what is taught, students should be able to guess what kind of thing they will be examined on.	B	0.15				
Exams should be based on what was taught, but if additional reading is to be done, it should be stated. Some students may/may not want to do extra, but at least if they know it is testable, they can choose.	B	0.15				
In a way, exams should be based on what is taught – it gives you a head start but you can gain extra information if you find the time!	B		0.51			

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
It is unfair to expect every student to do extra work. If they are tested on extra knowledge they might fail.	B	0.30				
Some students would inevitable accumulate more extra knowledge than others, which is unfair if you assess on this.	B	0.15				
Some students do not go and look up other sources, so it would be unfair for them if exams contained materials they didn't know about.	B	0.15	0.51			
Students should be assessed on their coursework, otherwise it would be unfair on those without access to further learning or motivation.	*B*	0.15				
If you examine on something, you have to be sure all students had access to it.	B				2.63	
The extra knowledge may separate the good from the excellent, but may also scare the average.	B	0.15				
I agree that exams should be based on lectures only, but it seems slightly unfair.	B	0.15				
Students should concentrate on what was taught. Learning extra for interest and to support taught information is good but should not be examined.	B	0.15				
This makes life easier for the student.	B	0.15	0.51			
Some people find it easier just to give facts instead of offering their own opinion.	B	0.15				
Picking out points from lecture notes is a lot easier than from books.	B		0.51			
If not, this would put a lot of pressure on the students.	B	0.15				
We need extra knowledge, but it would be nice if we didn't.	B	0.15				
The main core of the exam should test what was told in lectures as they make up the main part of studying.	B	0.15				
The majority of the exam material (about 90%), should be from lectures.	B		1.02			
Exams should be confined mainly to what was taught.	B					3.70
5-10% of the material should be of a different in comparison to what was taught, and that should be of 'constructed opinions' about what the other 'taught' information was based on or consisted of.	B				2.63	
Sometimes there are questions in the exam slipped in, and we haven't covered them in the course. They should stick to most of the ideas taught.	B		0.51			
Exams should only test students on what was taught, but any extra knowledge should be a bonus.	B	0.15				
Additional material shouldn't be sought in exams, but only in projects, take-home tests, etc.	B			1.85		
A fair medium is necessary.	B			1.85		
I believe a better method of examination needs to be found.	B?	0.15				
Perhaps in 1st Year, but to prove what you know and how committed you are to the course you should do some additional reading.	B/C		0.51			
Basing exams only on what was taught would be a whole lot easier, however, it is beneficial to you to research background reading and enhance your knowledge of the subject.	B/C					1.85
This would make life easier, but higher grades should be available to those willing to dedicate extra time to the pursuit of knowledge.	B/C					1.85

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
If students were asked to find extra knowledge and display it, they should expect them to, but otherwise it should be confined to what they have been taught.	B/C	0.30				
Basing exams on taught material is okay as long 'taught' includes prescribed reading.	B/C		0.51			
Exams should cover what was taught and what students were referred to.	B/C		0.51			
The subjects introduced are examined, and further references indicating extra reading should merit extra marks, in my opinion.	B/C					1.85
Exams should be based only on what was taught. If further knowledge is going to be examined however, I believe reference should be made as to where it can be found.	B/C			1.85		
If extra reading into particular areas is required, this could be made known and the students study in their own time. If not, they shouldn't be expected to learn extra.	B/C	2.07				
I agree that something obscure should without warning pop up in an exam, but also that some reading should be done.	B/C					1.85
I agree to a certain extent. But if the lecturer is covering a topic and then gives reference to a book or journal, students should then make an effort to read it.	B/C		0.51			
As we have not been told that any knowledge is needed other than that in lectures and textbook, this would be unfair. Had warning been given, I wouldn't mind.	B/C	0.15				
If the exams should require any extra knowledge then the lecturers should give a rough guide. Students shouldn't lose marks just because they do not know the in-depth information that is not taught.	B/C	0.30				
If students wish to write their own knowledge they should be allowed to, but others should not be penalised for writing what they were taught.	B/C	0.30				
Students shouldn't be penalised for not studying outside what they have been taught, but they should be rewarded for it.	B/C					
It is good to elaborate in exams as it shows confidence and ability, but if someone was unable to spend extra time studying, they may not be to blame.	B/C					1.85
Students should get credit for background reading, but not too much.	B/C		0.51			
Any extra knowledge may be beneficial to the individual student, but they shouldn't need it to pass.	B/C	0.15				
Students may have knowledge on some stuff that was not taught. But they should not get examined on it.	B/C	0.15				
Not everyone will get the same information, need to achieve better understanding but shouldn't be tested on it.	B/C			1.85		
Limits would have to be set. Extra knowledge to be tested but not too much, and exams to be within the learning objectives and course schedules.	B/C	3.55				
Students need to expand learning but should be confined to things clearly indicated as important not deterrents.	B/C		0.51			
Exams should go beyond lectures within reason. They are stressful enough without any really nasty surprises.	B/C		0.51			
Background and extra knowledge should be examined, but to a small degree.	B/C	0.15				
There should be a relative amount of *extra-curricular* material, but not an overpowering amount.	B/C					1.85

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
It can also include the reading or extra concepts which lecturers indicate but not in excessive amounts.	B/C					1.85
Even though learning extra might result in better understanding, there are chances that students might study something that won't be in exams.	B/C	0.15				
Some degree of extra knowledge could be asked for, but you don't want students learning too much information that is not relevant.	B/C	0.15				
Though *extra-curricular* learning should be merited, it would be unfair to question students on something unfamiliar. A course should encompass all relevant issues on a topic. *Extra curricular* work will benefit them on the taught subject by increasing understanding.	B/C				5.26	
Students may learn extra information, but this may not be what the examiner requires, so they could fail. Lecturers would need to set out boundaries of what and how much students need to know.	B/C	0.15				
With so many modules, etc. in the course, it is difficult to justify in-depth research into specific areas, yet students should be challenged by overall concepts, not just the bare essentials.	B/C				2.63	
As long as the extra knowledge is not vast, it should be studied, as an interest in the subject helps.	B/C	0.15				
Not vast quantities of extra knowledge, but evidence of further reading is a reasonable expectation – particularly from the course text.	B/C	0.15				
A little extra knowledge questions in exams are challenging, as long as there are not too many.	B/C	0.15				
They should be asked extra knowledge questions, but not a lot, especially in the early study years.	B/C	0.15				
The majority of the questions should be from the lectures, but a few questions relating to lectures etc, should maybe be asked.	B/C			1.85		
Exams should be mainly based on lectures, although some home reading and research should take place.	B/C		4.08			
Exams should be based mainly on what was taught, but some background reading should be required.	B/C	1.62				
In a way, exams should be on lectures, but also need to bring in bits that may have been found out by reading around as well.	B/C			3.70		
Exams should be based mainly on what was taught, but some questions could be from recommended reading.	B/C		0.51			
Exams should be mainly based on facts given out, but if the lecturer has given specific reading then these things can also be included. But clear information about what reading is required is important.	B/C				2.63	
The majority of questions should be on lecture notes, but there should be some outside knowledge of which references were given.	B/C			1.85		
Exams should be based mainly on what was taught, but perhaps expanded on, assuming that additional reading was done.	B/C	0.74				
Exams should be based on what was taught mainly, but more problem-solving is essential to ensure that the student has understood, not just memorised.	B/C		1.53			
Exams should be mainly on taught information, even though it would be unfair on those who read extra.	B/C		0.51			
Exams should concentrate on stuff that is taught but should include some questions based on extra knowledge.	B/C	0.30				
Having extra knowledge is a good measure of a hard working student, but what is taught should make up the majority of the exam, and extra questions should be based on this.	B/C	0.15				
Exams should be confined to what was taught, but this should not restrict extra study.	B/C	0.15				
Lecture material should be enough to ensure a pass, but excelling needs further study.	B/C	1.48				

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
Exams should be based on what was taught, but depth of knowledge of what was taught should be what determines one's grade.	B/C		0.51			
I do not totally agree with the statement, but students should be able to get a decent grade from what was taught.	B/C	0.15				
Students should be able to pass easily with taught material, but those with extra knowledge should be able to get a much better grade and deserve it if more work had been done.	B/C	0.15				
Exams should be based on lectures to a certain extent, if you can add extra knowledge from outside lectures it should be given extra marks.	B/C				2.63	
Pretty much, yes, because only then can you be sure each student is equally assessed and has equal chances. *Extra-curricular* learning can increase quality of answering.	B/C				2.63	
Exams should be on what was taught, but could be in more detail. If exams are on things, which were not taught students may have learnt different things.	B/C		0.51			
Exams should give students the opportunity to display extra knowledge and be credited for it, but this could be in different areas, so specific questions on extra knowledge would be unfair.	***B/C***	0.59				
It would otherwise be impossible to make sure each student had a fair chance, However, evidence of extra knowledge should be rewarded and full marks not be given to someone who showed none.	B/C		1.53			
Exams should be on lectures, but students should get more marks for elaborating.	B/C			1.85		
Exams should be based only on what was taught, but extra knowledge should be given credit.	B/C	0.59				1.85
The lectures should contain all that is required to pass, but to get a good grade one should have to study outside the lecture material.	B/C		0.51			
Students should not be expected to provide further information, but extra marks should be awarded for extra knowledge.	B/C	0.30				
Extra knowledge from the course work is good, but not from other books.	B/C	0.15				
The majority of the questions should be on what was taught, but a few questions should be asked to separate hard-workers from lazy students.	B/C	0.59				
Most things should have been taught, but perhaps the odd extension to seek out those who have studied more.	B/C		1.02			
Although I believe most of the exam should consist of taught material, I think there should be some degree of testing of extra knowledge to separate 'thinkers' from 'memorisers'.	B/C	0.15				
I agree that exams should be based only on what was taught except for problem-solving type of questions, which can let students display extra knowledge.	B/C	0.30				
This depends on the type of exam, Multiple-choice exams should only contain questions on the material taught, however with essay exams it's good to add extra bits that you know outwith the lectures.	B/C	0.15				
Some extra knowledge has to be displayed as it shows students have interest, but generally exams should stick to what was taught as it gives students a rough guide of what to study.	B/C	0.30				

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Students should be encouraged to find things out for themselves, but they should be given a good indication of knowledge and skills required for exams.	B/C	0.30				
They should not just be about what is learnt in lectures/labs but also about reading/research, but direction must be given as students cannot learn everything.	B/C					1.85
What is taught should include references for extra information, which can be examinable, as long as this is made clear to students.	B/C			1.85		
Students should expand on their learning but at the same time they need to know what kind of questions they will be asked in exams.	B/C		0.51			
To some extent I agree that exams should be based on what's taught, because if not then students would not know where to draw the line in their studies. Nevertheless some expanded study has to take place to reinforce work.	B/C		0.51			
It can be unfair to expect students to show further knowledge, as they will not know what to look for. Display of further reading is however likely to enhance understanding and improve answers.	B/C	0.15				
Extra knowledge is a good thing, but the basic knowledge should be evident in an answer.	B/C	0.15				
Exams should be mainly based on what was taught, but a little challenge is good for students.	B/C	0.15				
It should be close and very relevant to the subject so that everyone has a chance of answering it.	B/C	0.15				
Exams should ask students to display extra opinions, but not information that weren't actually taught.	*B/C*	0.15				
It is not fair to test people on topics that were not even discussed briefly in class. We can get better marks by including information not given in lectures.	*B/C*				2.63	
It would be unfair to ask about something never mentioned before, unless it was closely related to a topic.	*B/C*	0.15				
Students shouldn't need to know any more information, but they should be required to show their understanding.	*B/C*	0.15				
Students should only answer relevantly to the answer, and not extend the facts too much.	*B/C*	0.15				
While not a lot of extra knowledge should be asked for, students should be expected to have an interest in the subject and want to learn extra knowledge in the subject.	B/C	0.15				
Extra knowledge should be replaced with reasoning and evaluation from what is already known.	*B/C*	0.15				
It would be unfair to examine students on aspects that have not been covered. Students can express their thoughts as something extra in essay or long questions.	*B/C*	0.15				
It isn't fair to test students on what they have not been taught. However, testing on work from the textbook that may not have been covered in lectures but was required reading is okay.	*B/C*	0.15				
One should be able to answer all exam question from lecture information and references to course text.	B/C	0.30				
They could ask questions based on things that have been taught, but ask for more detail. If asking on things not taught, students would have an overwhelming amount of work to do.	*B/C*	0.15				
Some extra knowledge should be required, but exams should not rely on knowing specific facts, which were not specified.	*B/C*	0.30				
Some extra knowledge should be expected, but only simple things.	B/C	0.15				

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Students should be able to give fuller answers on their own knowledge as well. However, this may be difficult depending on how difficult they find the subject.	B/C	0.15				
It is true that students should be putting in extra work, but there is so much additional information not covered in lectures it would be difficult to know what to do.	B/C	0.15				
Although it is valuable to know additional information, the volume of knowledge obtained from lectures, etc. is usually quite large, and it is unfair to expect all students to fund time to learn outiwth this.	B/C		0.51			
Exams should be on what was taught, unless it is common sense.	B/C	0.15				
In a way this is fair as students know what to expect within reason, yet more knowledge wouldn't harm them.	B/C	0.15				
Some extra knowledge could be included, but it needs to be areas that all students should have researched.	B/C	0.15				
There is so much extra material you wouldn't know what to learn. Examiners should just put the information taught in questions that require more problem-solving.	B/C			1.85		
Information in specified textbooks and other specified reading material should also be included.	B/C			1.85		
Exams should extend to information you have been referred to in books.	B/C		1.02			
Lecturers should direct students to other examinable information.	B/C			3.70		
This does not encourage self-learning. However, I do not agree that examiners should assume that everyone in a class has learned something that the lecturer has not placed emphasis on.	B/C				2.63	
A good exam needs a combination of both tough and easy aspects.	B/C				2.63	
Exams should include other things closely related to what was taught to test skills of reasoning, evaluation, deduction, problem-solving, application, scientific thinking, etc.	C	3.84				
Some sort of problem-solving. Or general knowledge background information to a subject should also be tested. This shows a student has genuine interest, and can apply themselves to more than just learning facts.	C					1.85
Exams should also (in some situations) test students' ability to apply what they have learned to new situations.	C		0.51			
This shows that students can apply what they have learnt to other situations.	C	0.44				
Students need questions that need extra knowledge applied, to develop their ideas.	C	0.15				
No new facts should be introduced in exams, but some data analysis or opinion-based questions would be OK to help develop ideas.	C					1.85
The exam question use of knowledge taught and how it can be adapted to new ideas.	C	0.15				
It is more challenging for students to apply information gained from their own learning, and this is good.	C	0.15				
There should be questions to examine any wider knowledge.	C					
There should be some extra knowledge displayed and higher marks should be gained for it.	C	2.26			2.63	
At the age of 20 or over, one has to take control of one's life. If you just regurgitate lecture notes you can't be credited for ingenuity.	C					1.85
Students should display initiative and evidence of further learning.	C					1.85
People at university should be rewarded for using their own initiative.	C			1.85		

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
Exams should allow a student to be creative, to exhibit talent and initiative, and this should be rewarded.	C	1.03				
Many students would go to the bother of researching further knowledge on a subject, therefore they should be rewarded for it.	C	0.15				
Extra credit should be given for own knowledge.	C					3.70
Those students who do extra work should be rewarded.	C		1.53			
Students who make more effort should be rewarded.	C			1.85		
If people bother to read outside, they should get credit for it.	C		0.51			
This would not allow students who have studied excess material to gain any reward by their hard work.	C				2.63	
Students should be allowed to gain cerdit for outside knowledge in an area, instead of losing marks for not sticking to course content.	C					1.85
Students should have to display a desire to learn more and therefore should be able to excel in exams when tricky questions arise.	C		0.51			
Some credit should be given for extra knowledge, as long as it is relevant to the subject.	C	0.89				
Lecturers do recommend further reading and encourage you to follow this up. If you do this you learn more and should be credited for it.	C	0.15				
It has been explained that a certain degree of self-work must be involved to receive a good mark.	C		0.51			
In 4th Year we are encouraged to read around the subject. So this should be expressed in exams.	C					3.70
Everyone can learn from a set textbook and lectures, those with extra knowledge will do better.	C	0.15				
Lectures should include other subjects which can be examined. Students get a chance to shine if they can show extra knowledge outwith lectures.	C					5.56
Exams should allow students who have done more work and built on their study to show this.	C	0.15				
Students should be given the chance to show they know more than just what is in their lecture notes.	C	0.15				
Exams should test students' knowledge and how much they have done.	C	0.44				
Exams should consist of other material that is self-taught.	C	0.15	0.51			
Extra curricular questions make students use their initiative.	C	0.15				
Some extra knowledge is important and beneficial and should be expected.	C	1.77				
Students should be encouraged to gain further knowledge.	C	0.44				
Knowledge from everywhere is constantly being picked up and students should be doing a little further reading.	C	0.15				
Some extra knowledge to be expected, depending on subject and standard.	C	0.30				
Students should give good solid background information, but as with questions are.	C		0.51			
Students should be required to expand on what was taught.	C	1.03				
Exams should be on maybe not just what is taught, usually you do some background reading and find out extra anyway.	C					1.85

APPENDIX 7e continued: Glasgow University Comment Categories – Part Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Exams should be on things that were at least mentioned during the course, but require detail from personal study. Questions requiring a bit of original thought always makes exams more interesting.	C				2.63	
Exams should be confined to subject taught, but not necessarily information given. Students should be expected to research information themselves.	C				2.63	
Exams should not be strictly confined to what was taught, but instead should focus on areas mentioned but perhaps not taught in lectures.	C				2.63	
I think exams should be on what the lecturer has outlined in lectures, whether he has taught it or advised us to read up on it.	C			1.85		
Usually what is taught in lectures is a guideline or skeleton of what to learn independently. University is about learning how to learn.	C		1.02			
At university, lecturers provide only skeletal information which students are meant to beef up. This further knowledge should be assessed in exams.	C	0.89				
Nothing really in university is taught absolutely, you have to read around it to get more knowledge and to have own opinions on things.	C			1.85		
Exams can go beyond lectures as long as an idea of what one needs to know is in lectures so that they know what to read up in the books.	C		0.51			
All key points should be taught so that students know what to read about in books.	C			1.85		
Students need to learn to find extra information themselves.	C	0.15				
Working beyond lectures is all part of the course at university.	C	0.59				
University is about integrating what you are required to learn with what you are interested in.	C					1.85
At university students are expected to think for themselves.	C	0.30				
Basing exams on lectures may have been true for school, but at university level there should be recognition of extra knowledge.	C		0.51			
Basing exams on taught material only results in students lacking in their own techniques in information and problem-solving.	C		0.51			
Basing exams on lectures only does not allow students to incorporate their own ideas and opinions.	C		0.51			
Part of learning involves going beyond lectures and finding things out for yourself.	C	0.30				
The more the exams ask, the more the students are required to think.	C				2.63	
Basing exams on things outwith lectures allows for original thought.	C					1.85
There should be some questions to stretch the more able students.	C	0.15				
Exam questions should be challenging.	C		0.51			
Some questions need to stretch students' knowledge to limits.	C	0.15				
It is better for students to expand their knowledge.	C	0.15				
For a wider knowledge on a given subject one must look beyond the lecture notes, i.e. read textbooks.	C		0.51			
Good students should have a broad scientific knowledge.	C	0.15				
Question should be based of what was taught with the opportunity fur further discussion of the students' ideas.	C					1.85
A good student should be able to learn beyond what is expected of them and be able to extend their answers beyond their absolute knowledge.	C	0.15				
Basing exams only on what was taught doesn't test your understanding.	C					1.85

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examination should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
They should be marking on understanding and valid opinion as well.	C					1.85
There should be room in exams for additional information to be put forward by students, so that they can show their level of understanding.	C		0.51			
By showing extra knowledge, students show they have a fuller understanding of the subject.	C	1.33				
Students should obtain additional information to what was taught to assist understanding.	C	0.15				
Students should be able to spend time on their own expanding on what was taught for a better understanding.	C		0.51			
Students should be encouraged to read background material for a fuller understanding.	C		1.02			
Students should be made to develop on what was taught for better understanding.	C					1.85
Understanding concepts is more important than remembering facts.	C	0.15				
It is unfair to restrict exams to what is taught only. Exams should cover information in directed reading to help understanding of class material, not just information memorised for Multiple-choice tests.	C			1.85		
How can students really learn if they are only taught? (I hear, I forget; I see, I remember; I do, I understand!)	C					1.85
Because students should do their own study, the exam should also cover knowledge which is not taught, but which should be known through self-study.	C	0.15				
I agree that exams should not be based only on what was taught because our timetable allows us time to do extra research on topics introduced by our lecturers.	C	0.15				
Exams should cover any/all parts of the course guide, not only what was covered in lectures.	C	0.59				
There should be a bit of both lectures and extra knowledge.	C		0.51			
Students should also be examined on material from their textbooks and required reading.	C	0.15				
Students should go on to explore avenues of investigation that open up, based on ideas presented in lectures.	C	0.59				
Exams should go in more detail, but be on the same topics.	C		1.53			
It is not fair to spring unknown topics on people, but to give a topic and allow individual research allows people to find their own viewpoint on a topic.	C					1.85
Students should be able to show that they have studied outwith lectures, it shows their dedication to their subject.	C	0.59				
Extra knowledge shows that extra material has been learnt and time has been taken to look at other sources other than lectures.	C	0.30				
Extra knowledge shows more interest in the subject.	C	0.30				
If a student is interested in a subject, they should be able to show their extra knowledge.	C	0.15				
Keen interest should be given extra merit.	C	0.15				
In this case, the exams would just be testing memorisation of facts and not understanding.	C	0.44				
Exams should test how much effort students put in, not just if they can memorise things.	C	0.15				
Some extra knowledge, prior knowledge, and own ideas can be used in answers.	C	0.44				

APPENDIX 7e continued: Glasgow University Comment Category – Part 2 Question 5

Q5: Examination should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
If examined only on lectures, students would then be unaware of the need to know extra information.	C	0.15				
Rote learning shouldn't be rewarded.	C	0.15				
Memory exercises are not an adequate test of ability.	C					1.85
They should be based around what is taught, but allow students the freedom to demonstrate their ability to look at questions from other dimensions.	C					5.56
Exams should not be confined to what was taught but any questions outwith lecture material should be based on required reading.	C	0.15				
There should be room for additional information in the questions, but should be based on taught work.	C					1.85
Extra information should be examined as long as it is relevant.	C				2.63	
Exams should not just be on what was taught, but should also include related material.	C		1.53			
It is up to the student to extend their knowledge.	C	0.15				
Outside reading is essential to get a broader view of the subject.	C					1.85
Exams should ask students extra knowledge questions to encourage students to broaden their learning.	C	0.15				
Exams should be more 'open-ended', allowing students to display their knowledge more freely with less constraint.	C	0.15				
Even in the early years at university students should be gaining practice learning more than what is set down to them as this will be expected in their honours years.	C	0.15				
Confining exams to lectures only would produce poor graduates.	C	0.15				
Exams are a representation of the work you do. In the work place, you have to have a much broader knowledge.	C	0.15				
The added learning of facts not covered in lectures can only be beneficial in the future.	C	0.59				
You are trying to churn out great minds of the future; not a flock of sheep, which will all, know exactly the same thing.	C	0.15				
Showing initiative is good practice for job situations.	C	0.15				
To be a good scientist you must have extra knowledge.	C	0.15				
Lecturers can't possibly convey all information needed in the time available, so students are expected to do extra.	C	0.74	1.02	1.85		1.85
What is taught is a very shortened description of the facts. In the textbooks they expand on the facts.	C		0.51			
Basing exams only on what was taught would restrict students in further years in university and outwith.	C	0.15				
Extra knowledge would be used to distinguish between poor and better; lazy and diligent students.	C	0.44				
This will show who has been making an effort to study compared to those trying to get away with just what they have learnt in lectures.	C	0.30				
This would distinguish between a good and a 'bad' student.	C	0.30				
The difference between being good and being very good is the ability to display extra knowledge. Anyone can learn what they have been taught.	C	0.15				
It would be different to distinguish between students with differing capabilities if they all had the same answers.	C	0.15				
This gives best students the opportunity to 'shine'.	C	0.44				
Basing exams on lectures only would restrict the high-grade students.	C		0.51			

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Students should work on their own to a certain level. And not rely heavily on what is taught.	C	0.15				
It is important for students to find out information for themselves as well as know what they are taught in lectures.	C	0.15				
Setting exams beyond lectures encourages independent study.	C	0.15				
If exams are on more than just what was taught, it encourages you to go out and get more information on a subject rather than just reading lecture notes.	C		2.55			
Extra knowledge should be picked up when reading around topics.	C	0.30				
If the student studies properly they will pick up any additional information needed.	C		0.51			
Textbooks should be used.	C		0.51			
I disagree with this because one usually has to read textbooks, etc. and do their own work on topics.	C		0.51			
If there is an essential textbook some questions could be taken from that.	C			1.85		
Extra knowledge shows an interest in the subject and will help in learning.	C	0.15				
I am not a robot to give back just what the lecturer thinks.	C	0.15				
Students should work on their own to a certain level and not rely heavily on what is taught.	C	0.15				
Often exams do test on what's been taught, but one can't just rely on what the lecturer has said, must find other sources. ***	C	0.15				
On the whole, exams are based on what we are taught, but for a further understanding we need other knowledge.***	C	0.15				
Extra knowledge is good.	C	0.15				
Reading up on a topic can provide more information and sometimes gives a better explanation than a lecturer.	C				2.63	
Extra knowledge is good as it broadens students' education.	C	0.44				
Students should try to learn as much as possible.	C	0.15				
Material taught should form a basis of the exam, not the majority.	C	0.15				
It is better to have too much knowledge than not enough.	C	0.15				
Doing a little extra for themselves helps students with additional confidence as they know more about the subject.	C	0.15				
Students should learn extra information to supplement what they learn in lectures so that they can take exams confidently.	C	0.15				
Students should learn to expand on the information given to them to give them a better chance in the exams.	C	0.15				
Not all information in exams is straight from lectures, students are expected to do further work outside lectures to gain extra knowledge.	C	0.15				
Only that information that has been introduced by lecturers should be examined.	C	0.15				
If exams were confined to what was taught students wouldn't really learn anything – they would just be repeating everything the lecturer said.	C	0.15				
Basing exams only on what was taught does not allow for individual subject research.	C		0.51			
Exams include a large range of questions, so students need to learn further.	C	0.15				

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
The information given is often out of date, credit for discovering more or newer theories would encourage students to research.	C	0.15				
The only knowledge that should be expected to be known by students is that taught in lectures, material in the course text, and additional reading given by the lecturer.	C	0.15				
As long as the extra knowledge is available to students, i.e. in library, then they should have obtained it and so it should be tested.	C	0.15				
If it is clear what material needs to be covered, then it should be included in exams.	C		0.51			
To pass, students should display extra knowledge as it shows they are capable.	C	0.15				
Students should not pass by just having a wee look at lecture notes, they have to be able to express extra knowledge.	C	0.15				
It is okay to have extra/unknown material questions. I prefer essays rather than Multiple-choice questions. We were given wrong information before, in the last exam. We were told that there were going to be essays as well as Multiple-choice questions. This affects how I study. ***	C	0.15				
Facts that lie outside the course may be given in the exam paper so that new connections can be made in the brains of the examined.	C		0.51			
Different lecturers teach differently – get a crap lecturer and you're stuck! Plus it's more interesting to make a bit of effort yourself.	C					1.85
There is enough for students to learn in the course without being examined on extra material they may not even know about. **(B – Question misconstrued).**		0.44				
There is so much to study that 'extra curricular' study that must be specific and full of detail is unlikely to come up in an exam. However, learning concerning subject on the course is a great help. **(B/C + Question misconstrued)**					2.63	
Exams are hard enough as it is without having to bother with things one does not need to know. **(Question misconstrued)**		0.15				
It is unfair to expect students to be able to display extra knowledge when they don't need to. **(Question misconstrued)**		0.15				
It would be easier if it were just the subjects taught. **(Question misconstrued)**		0.15				
If exams are not on what was taught or related topics, it can be difficult. **(Question misconstrued)**						1.85
As long as the topic has at least been mentioned so you know that it might come up. If a subject that has never come up in lectures appear in exams, they are annoying. **(C + Question misconstrued)**				1.85		
Throwing in questions not in the course is a bit unfair. **(Question misconstrued)**		0.30				
Only what is in the course should be examined because one can't guarantee what people have read. **(Question misconstrued)**					2.63	
If extra information is relevant enough to have in an exam, it should also be in the course. **(Question misconstrued)**		0.30				
No question not in the course should be asked, but other information of students' own research should be able to be included. **(C + Question misconstrued)**				1.85		
Exams are to test on certain areas of study (syllabus), and this should be stuck to, otherwise it would be unfair. **(Question misconstrued)**		1.33				
Not all students have time to study things that were not in the course. **(Question misconstrued)**			1.02			
It is the syllabus that should count in exams. **(Question misconstrued)**		0.15				
It is surely wrong to mark students on topics not covered in course. Surely it makes sense to ask questions on what is taught. **(A + Question misconstrued)**			0.51			

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examinations should be confined only to what was taught. COMMENT	Position	Level 1	Level 2e	Level 21	Level 3	Level 4
Extra knowledge is a good thing, but students can't be expected to learn stuff over and above the coursework (syllabus). (**C + Question misconstrued**)		0.15				
I agree because exams should be about nothing but the course. (**Question misconstrued**)			1.53			
It is unfair to divert from the syllabus too much, this has to be documented. (**Question misconstrued**)		0.15				
Exams should be confined only to what was taught, however extra study should be rewarded – no question should be based outwith the syllabus. (**B/C + Question misconstrued**)						1.85
To a certain extent. Having something not related to anything on coursework would be unfair, we can't research into everything just in case. (**Question misconstrued**)						1.85
Students should just learn what they are meant to, if they had to learn other things as well at random then there is a higher chance of them failing. (**Question misconstrued**)		0.15				
It would be wrong to assess students in one subject when they are studying a totally different one. (**Question misconstrued**)		0.15				
I disagree, things should be broader, but I wouldn't like a question in Quantum-Chrom0-Dynamics popping up in my Ecology exam. (**C + Question misconstrued**)			0.51			
More in-depth questions on a subject in an exam are OK (shows you have done more than asked for) but large questions on alien subjects are not fair. (**C + Question misconstrued**)			0.51			
It is easier to concentrate on what to learn when you know the set objectives. Excess learning is confusing if it doesn't interest you. (**B + Question misconstrued**)		0.15				
It is very difficult to anticipate what will be asked in exams if there is no limit in what can be examined. But a fuller picture is required in order to understand and learn a topic. (**C + Question misconstrued**)			0.51			
Overspecialisation is not a good thing. (**? – Question misconstrued**)		0.51				
It would be hard to know what to study if it was **randomly chosen** from a selection of books, etc. in the field of study. (**Q misconstrued**)			0.51			
It is unfair to examine students on things that are not part of the course. Students have difficulties learning all the information being taught already. If they were to display extra information, it would be getting away from the course objectives. (**Question misconstrued**)		0.44				
Exams should contain only recommended reading material and what we have been told to learn from this, like a set of objectives for each subject. (**B/C + Question misconstrued**)					2.63	
If the exams were not based on lectures, no one would know what would come up in them. There would be no point in having learning objectives. (**Question misconstrued**)			0.51			
Exams should be on coursework covered. If not, it will have no real estimate of what or how the people learn the work in the course. (**Question misconstrued**)		0.15				
Exams should be on what is taught in the course as this is what every student is expected to learn. (**A + Question misconstrued**)						1.85
If we were told what we are meant to study, fair enough. But to evaluate heavily on subject not in the course is unfair. (**B/C + Question misconstrued**)						1.85

APPENDIX 7e continued: Glasgow University Comment Categories – Part 2 Question 5

Q5: Examination should be confined only to what was taught. **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
People should think on their own, but it seems unfair to test on material that has never been mentioned in the course and people may not have come across. **(C + Question misconstrued)**						1.85
If extra knowledge is added to what has been taught, the course work could become too widespread and not focus on the main points. **(Question misconstrued)**		0.15				
Exams are based on coursework and nothing else. **(Question misconstrued)** ***		0.15				
Students should know extra knowledge, but why include something in exams, which no one knows about, or cares about? **(C + Question misconstrued)**		0.15				
The course should have set material and knowledge, and this should be sufficient. **(Question misconstrued)**		0.30				
Lecturers have to be fair and stick to CIDs. **(Question misconstrued)**				1.85		
Exams should be based on the study guide, as it would be unfair to examine on such a wide scale. **(Question misconstrued)**			0.51			
Some students might find the course demanding and cannot afford to spend time remembering other details which are not in the course. **(Question misconstrued)**		0.15				
It is unfair to test on material not outlined for the students. **(Question misconstrued)**		0.15				
It is not fair to test people on things they are not expected to know. **(Question misconstrued)**		0.15				
Students should only be given exams containing knowledge they should know. **(A – Question misconstrued)**		0.15				
Although students have to find information for themselves, it is not fair to examine them on what they don't know. **(C – Q misconstrued)**		0.15				
Exams are not meant to be testing students on general knowledge. **(Question misconstrued)**		0.15				
If not this would be more of a general knowledge quiz. **(Question misconstrued)**			0.51			
Even though doing extra reading etc. is a good thing, it's not fair to test what hasn't been outlined as not everyone has the opportunity to get through extra reading. **(B/C – Question misconstrued)**			0.51			
Students spend time studying what they believe they have to know, not on general extra material. **(Question misconstrued)**		0.15				
It is not fair to examine students on information they are not aware that they need to know. **(Question misconstrued)**		0.30				
If students are not taught something they would not know that they need it. **(A – Question misconstrued)**		0.15				
Some students have enough to do just keeping up with lectures and labs without having to do more than is required. **(B – Q misconstrued)**		0.15				
Extra information should be credited, but not too highly as some people find it hard just to learning what's in the syllabus. **(Question misconstrued)**		0.30				

APPENDIX 7f: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* COMMENT	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I attend all lectures and labs, so I should be bale to pass.	A	0.74				
I am not confident in the lecturers. I don't feel we are informed enough in what we need to know. Some lecturers are very poor, so it is hard to take notes.	A	0.30				
I too can memorise things. ***	A	0.15				
I understand everything so far, it's just a matter of reading my notes to transfer everything to memory.	A	0.15				
I turn up at lectures and labs and complete my work, although I need to read and go over my lecture notes more than I do at the moment.	A	0.15				
I think what is needed to pass the course is studying the given notes and trying to realise what is said in them.	A	0.15				
By attending lectures and keeping good notes, I am confident that I am learning the course material as best as I can.	A	0.15				
I have been to most lectures and labs, so I should pass.	A	0.15				
I should be able to pass as long as I stick to the guidelines set by handbook and the lecturers, and study appropriately.	A	0.15				
I feel my understanding of **what's in lectures** should be sufficient to get at least an average pass because it is all straight-forward.	**A**/B	0.44				
The course seems to be assessed on what we are taught and requires simple ability to recall facts, as opposed to forming them into essays and reports and the likes of such. ***	A/**B**	0.15				
I am sure I will not pass the course because I sleep during lectures and don't read my course book.	**A**/B	0.15				
I am not confident as I have done very little work so far.	**A**/B	0.15				
I have become very lazy and don't do work, so I don't think I'll pass, unless I work extremely hard.	**A**/B	0.15				
I don't think I'll pass because I don't work hard enough.	A/**B**	0.15				
Students should all pass because they all go to the same lectures, learn the same work and are all given the same opportunity.	**A**/B	0.15				
I'm not sure because I don't feel that this course is quite as simple as it appears now.	A/**B**	0.30				
I find the course quite difficult.	**A**/B	0.15				
I feel that biology is a very difficult subject that I shouldn't have done at university level.	**A**/B	0.15				
I haven't performed well so far, so I am not confident about passing.	A/B	0.30				
I am leaving at the end of the year, so I do not put enough effort into studying.	A/**B**	0.15				
I have no background in biology whatsoever and the course is very difficult when all the information given is new to me. I find that I have to do a lot of background work myself.	B	0.89				
I do not know if I will pass or not. I feel that although it is stated, no previous knowledge in the subject is a severe disadvantage, considering the pace and amount of material taught. ***	B	0.15				
I am not quite sure just now, we'll see later.	B	0.59				
Couldn't be too sure just now, anything could happen on the way.	B	0.59				
Can't be too sure just now as I don't know how the rest of the work will be.	B	0.15				
One should never be too confident.	B	0.44				

APPENDIX 7f: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I don't want to tempt fate.	B	0.30				
I am not sure because it depends on how I feel on exam day and how lucky I am.	B	0.15				
In the genetics exam I felt very unsure of my performance, I felt I failed, but I got a 'B'. In the Plants and Biotech exam I thought I performed very well, yet I got an 'E'. This has left me confused.	B	0.30				
I am not quite clear what is expected of me in the standard of work, and I am not sure whether I am studying too much or too little.	B	0.15				
After the last report that I just handed in, I don't think I'm confident I am going to pass.	B	0.15				
It always depends on what comes up in the exam.	B	0.15				
Although I have successfully passed my 1st and 2nd modules, I could not say that would happen in the next exams.	B	0.15				
Even if I work a lot, I feel like I could still get confused between similar Multiple-choice or in essays. I feel like I could easily express things the wrong way and end up saying something different from what I mean.	B	0.15				
I find some of the course work confusing and am constantly ill – passing this course is already a challenge.	B	0.15				
I am never confident.	B	0.30				
I don't have confidence in anything I do.	B	0.15				
I know I can pass, but I don't know if I will.	B	0.15				
I have found that there is a lot of facts to be learned which I find difficult to memorise, considering there are other courses too.	B	0.30				
There is way too much information to take in , in a short period of time.	B	0.30				
Some of it is quite difficult and there is a lot of work and continuous assessment, which makes it much harder. This also leads to me sometimes being unprepared which makes me less confident.	B	0.15				
Some modules are interesting and straight forward, so I think I will pass them. Others however, are not of any interest so it's hard to remember issues in them. Also find some lecturers unable to answer aims as others do.	B	0.15				
I am going to have to get my act together in order to pass.	B	0.15				
I don't think I am confident about passing, it would depend on how much I study.	B	0.15				
I'm not sure I'll pass because I need to study more than at present.	B	0.15				
I am not confident about passing, I think I will have to put a lot of work in, but it could happen.	B	0.15				
Whether I pass or not will depend on how much I study.	B	0.15				
I feel I have not pushed myself hard enough throughout the year. I underestimated the course and this proved fatal.	B	0.15				
I find it difficult to motivate myself to study. When I get started I can go for hours, but I do not do it nearly enough.	B	0.15				
I believe I have a fairly good understanding of biology, but also need to work hard to pass.	**B/C**	0.15				
I hope I will pass.	**B/C**	0.74				
I am optimistic.	**B/C**	0.30				
There have been circumstances that led to my missing a lot of lectures and labs, but hopefully I will pass this year.	**B/C**	0.15				

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I have to work on Multiple-choice questions. (Since I'm not used to them, I could have spent more time testing myself on them instead of also trying to improve my essay writing – I failed!!!) ***	B/C	0.15				
I was more confident before the results came back from Modules A & B, but due to the stressful events the day before the exams I didn't perform at my best. I still think I should pass.	B/C	0.15				
I did not do quite well in the past modules because I missed one of the exams. Now I have changed my study techniques and hope I will pass,	B/C	0.15				
I suffer from self-doubt at times. However, my experience in the 1st Term shows that if you put in the effort you will be rewarded – and the teaching and demonstrations were excellent.	B/C	0.15				
I will have to pass because I have to, if I don't I will be in a great deal of trouble.	B/C	0.30				
I am going to work hard because if I don't pass my parents will be let down and I will get kicked out of university.	B/C	0.30				
If I don't pass I will kill myself.	B/C	0.15				
I hope I will pass because if I don't I will have wasted the entire year repeating what I failed last year.	B/C	0.15				
With some work at understanding some more difficult theories, this should be easy to pass (but hard to get a good grade)	B/C	0.15				
I feel that my notes are reasonable, and with some hard work going over these and doing a little extra I can pass.	B/C	0.15				
I can pass it – I do have the ability to study and learn effectively, whether I do it or not is another matter.	B/C	0.15				
I can pass it – if I don't it will be due to my own laziness.	B/C	0.15				
Having done no biology at all at school I find there is quite a lot of work and it is a whole new terminology. But if I put enough work into it I hope I will pass.	B/C	0.30				
My progress so far has shown that I am coping with the course, although I do believe I am underachieving. ***	B/C	0.15				
I have some room for improvement of my performance.	B/C	0.15				
I have managed so far, even though the work has been quite uninteresting. So with more interesting work I should find it easier.	B/C	0.15				
I am not totally confident, but I am motivated to give it my best shot.	C	0.15				
I will pass because I enjoy and like the course; I find it interesting, and motivating. This makes it easier.	C	8.86				
Because I am interested in the course, I have made the effort to do more reading and studying, therefore I should pass.	C	0.15				
I go to lectures, attend labs, my results so far have been good and I know I will continue working because I enjoy biology and find it interesting.	C	0.15				
I intend to do biology for all the 4 years of my course because I like it and enjoy it.	C	0.15				
If I do enough work and find some enjoyment and interest in the course I think I can pass.	C	0.15				
I am, good at biology, everyone says so, and I am always better at things I am interested in.	C	0.30				
I really enjoy biology and feel I want to pass rather than need to.	C	0.15				
I am confident I will pass because what we are doing now is similar to what we did for 'A-Levels', so I understand it.	C	2.51				

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
It's going to be hard work, but I am determined to gain a degree. I feel the as the course becomes more specialised I will enjoy it more and be even more determined. I am here, therefore I might as well do my best.	C	0.15				
I have not as yet come across any areas of great difficulty, believe myself to be of reasonable intelligence, and enjoy the course, which is an important step in passing anything.	C	01.5				
I learned a lot last year, now I want to improve myself.	C	0.15				
I work well, attending lectures and labs; read over my notes and course text at home, as well as around the topics in the library and on the Net.	C	1.62				
I have attended all lectures, handed all assignments in, and achieved good grades in all tests, so this means I could pass.	C	0.44				
I study hard enough, hand assignments in on time, and do external research as well.	C	0.59				
I write up notes out of lectures from different sources and thus have a broad view of all aspects of this course.	C	1.18				
If I attend lectures and do some of my own work, then I am confident that I can pass.	C	0.30				
I attend lectures and do some additional reading.	C	0.15				
As long as I use my supporting text, lab books and lectures notes, I feel that I will pass.	C	0.74				
There is plenty of information that can be researched if one finds it inspiring and interesting as I do.	C	0.74				
I attend my lectures and labs, but also do a lot of home study using various books, etc. I have a good grasp of the subject.	C	0.59				
I have done well so far, and hope to continue by learning my notes, understanding them, and gaining extra from other sources.	C	0.44				
If I work hard and have determination in doing my own research and lots of private study, I should be able to gain a decent grade eventually.	C	0.15				
I am confident to pass as I understand the lectures and have been researching the topics introduced to me further.	C	0.15				
I am putting the effort into learning the given topics and researching them myself.	C	0.15				
I put the work in and enjoy finding out extra facts about what the lectures have been on. I know that I can talk to others to find out extra facts and that the lectures are there to help, if I need it.	C	0.15				
If I study and research material, I will pass this course.	C	0.15				
If I focus and dedicate myself to revision and extra study, I should be able to pass.	C	0.15				
I have background knowledge on the subject, go to all lectures and do reading in my own time.	C	0.15				
I know what I have to do if I want to pass. It is all in my own hands, I have to put in extra studying at home.	C	0.15				
I hope I will pass since I'm attending lectures, etc. and doing other reading, etc.	C	0.15				
The lectures are good, labs are helpful and the textbook is excellent.	C	0.59				
I am confident I'll pass due to the high level of teaching offered at university, and also due to my own effort and level of hard work.	C	0.15				
There is enough information given in lectures, labs and in the textbook to allow me to do this.	C	0.44				
I do not mind studying as I think Campbell is interesting and well illustrated with pictures and good examples.	C	0.30				
I am confident about passing because I use lecture notes and textbooks, and learn by seeing connections rather than memorising.	C	0.15				

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* COMMENT	Position	Level 1	Level 2e	Level 2l	Level 3	Level 4
I am confident about passing because I have the course text.	C	0.15				
I am confident I will pass this course because I want to, if I didn't want to I wouldn't be here.	C	0.44				
I am quite good at biology, as my results so far have shown.	C	0.30				
I have a fair understanding of biology in general, and have obtained good grades.	C	0.15				
At the moment I am not working at the best of my ability, but I am still passing, so I can still do better. ***	C	0.15				
So far I have worked hard to try and learn more than just the basics.	C	0.15				
I feel that if I work hard and try to learn more than just what I actually need to know or am taught, I can pass.	C	0.15				
I feel that the exams are very well laid out, and with the book and lectures, all the information is available.	C	0.15				
The information provided gives a good basis and is clearly presented; and I work hard.	C	0.15				
There is a good balance between continuous assessment and exams, which is helpful.	C	0.15				
I like the idea of continuous assessment, not just relying on one final exam, which would give too much pressure. I perform better in assessments than in exams the majority of the time, so I think I'm gonna pass.	C	0.15				
The modular exam system is better than one final year exam. Allows smaller blocks of information to be learnt thoroughly.	C	0.15				
There is good communication between lectures and labs about progress, and information from continuous assessment gives an idea of progress.	C	0.15				
It depends on whether I understand the topics in detail.	C	0.15				
I will pass as long as I can identify and sort out problems I have.	C	0.15				
I am determined to pass this course, and year by year my techniques for learning can only improve.	C	0.15				
I am prepared to do what it takes to pass it.	C	0.15				
I understand the process by which I can adapt to the learning environment of the university, and that I have the ability to evaluate my own progress and ask others to do so, so that I may change if the need arises.	C	0.15				
I am confident I will pass because I have been and will be working hard on the course.	A/C	16.4				
I know that if I work hard I could pass. It's just a matter of will power.	A/C	6.79				
Hard work produces good results.	A/C	0.44				
Even someone with no real talent for biology can pass with hard work.	A/C	0.15				
I will pass if I learn the work and motivate myself.	A/C	0.15				
If I work hard enough I know that I could pass the course, but so far I haven't been working and it's reflecting in my results.	A/C	0.15				
Even if I take a course I don't like, I work hard enough to pass.	A/C	0.15				
I attend lectures, study regularly and make sure I can answer the learning objectives in course booklet.	A/C	0.44				
I have kept up-to-date with work, and understand what is being taught.	A/C	0.15				

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I think that if I work hard, continue to go to lectures and keep doing the continuous assessment, I can pass – perhaps not with flying colours.	A/C	0.15				
I can pass this course if I put the work in, but there is a difference between being able to do something and actually doing it.	A/C	0.15				
As long as one attends lectures and goes over work to ensure understanding and learning, they should be able to pass the exam.	A/C	0.15				
I go to lectures and labs, and study hard in my own time.	A/C	0.74				
I attend all lectures and make an attempt to look work over before tests and complete assignments.	A/C	0.44				
I attend most of the lectures and work so as to understand the topics I am required to understand.	A/C	0.15				
I should be able to pass because I am doing everything that is asked of me.	A/C	0.15				
If I turn up and I study, I should pass quite easily. At the moment I'm doing what I should.	A/C	0.15				
I complete all the work that is required.	A/C	0.30				
If I do the required work, I should be able to pass this course.	A/C	0.15				
If I do the work and attend lectures, etc. I should pass with sufficient revision.	A/C	0.15				
If I do homework, passing shouldn't be a problem.	A/C	0.15				
I am confident of passing because I am learning and reading what I have been taught.	A/C	0.15				
I have been paying attention and studying.	A/C	0.15				
I learn all the course work thoroughly.	A/C	0.15				
I have worked hard throughout and have attended the best I can.	A/C	0.15				
I attend all the lectures and hand in all my coursework, so I am confident I will pass.	A/C	0.15				
By doing the necessary reading and learning I feel I can pass.	A/C	0.15				
If I set my mind to studying, I'm sure I can pass.	A/C	0.15				
I hope to pass as I have learnt to work steadily through the year.	A/C	0.74				
I will pass well if I put effort into my revision and plan my revision ahead, instead of leaving it to the last moment.	A/C	0.44				
There is a lot to learn, but if I start revising early enough I am fairly confident I can pass.	A/C	0.15				
I revise the information and commit it to memory in adequate time.	A/C	0.15				
As long as one revises, they should be able to pass.	A/C	0.15				
I have come this far with still a lot of room to improve my revising skills.	A/C	0.15				
I f I study hard, learn the facts, and complete the assignments on time there is no reason why I shouldn't pass.	A/C	0.30				
I am confident as I will try my best to do all the work and hand it in on time and study hard.	A/C	0.15				
I have done all the work to date, and intend to continue studying for the exams.	A/C	0.15				
I have worked quite hard, met all deadlines and understand the course so far.	A/C	0.15				
I believe I can pass it, but just how well depends on how much work I do and how much time I put to it.	A/C	0.30				

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Q6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
If I study hard and hand in work on time then I know I can pass, but I'm not sure by how much.	A/C	0.30				
If I study what's in the syllabus, I should pass the exam.	A/C	0.15				
I will pass as long as I can improve my standard of work.	A/C	0.15				
I have all the necessary information to pass now, it is just a case of learning it.	A/C	0.15				
I can meet all the deadlines and gain sufficient knowledge to pass the exams.	A/C	0.15				
I am confident of passing because I will always study hard for the exams.	A/C	0.30				
I know I can pass because I put enough work for the module exams.	A/C	0.15				
I am confident I can learn and understand all the information for the exam.	A/C	0.15				
I usually study for exams.	A/C	0.15				
I will do all the work when the time for the exams comes.	A/C	0.15				
I have finally left my lazy phase and have started to work.	A/C	0.15				
If I learn all my course work I know I will pass.	A/C	0.15				
I understand all the work so far.	A/C	0.44				
I believe I know enough to pass.	A/C	0.30				
I will pass if I study using my lecture notes and try to understand them, not just memorise.	A/C	0.30				
I believe I will pass because I learn by understanding, not memorising.	A/C	0.15				
I make sure I do all the work and understand it.	A/C	0.15				
Nothing seems to be conceptually difficult, and a fair field of work has been covered already. ***	A/C	2.36				
I need to do a bit more study, but work in 1st Year isn't actually that difficult. ***	A/C	0.15				
Level 1 work obviously has to be relatively simple to give a basis for those who haven't studied biology before to help them incase they want to continue with it next year. As long as enough work is done, passing should be okay.	A/C	0.15				
I will pass because it all Multiple –choice questions. ***	A/C	0.15				
I passed my last two modules well, and I'm doing well so far. If I keep it up or work harder I should pass well.	A/C	1.48				
There is enough information and help available that everyone should be able to pass.	A/C	0.74				
The information required to pass this course is readily available to me.	A/C	0.15				
I am a confident person.	A/C	0.44				
I have a good understanding of key concepts in biology so far, so I should pass.	A/C	0.44				
I understand the course so far, with a little more I'll be able to pass with ease.	A/C	0.15				
I understand the course we are covering and am willing to work hard in my own time in order to do well.	A/C	0.15				
Since the preliminary exams, I have turned over a new leaf. So I believe I'll pass!!!	A/C	0.15				
By continuing to work as I have been and learning the basis which I can relate to the lectures, I feel I can pass this course.	A/C	0.15				

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 21**	**Level 3**	**Level 4**
I prefer to be told information.	A			1.85		
I am not particularly confident, am shy, and would be uncomfortable doing so, so generally I prefer to keep quiet.	A		3.57			
I'm too self-conscious.	A		0.51			
I am not confident.	A				2.63	1.85
I don't express myself at all because I find it intimidating.	A			1.85		
I prefer to write answers and not being put on the spot.	A			1.85		
I only express if I know the subject well enough, and feel I know what I'm talking about.	A		1.53			
I won't express myself till I'm sure what I'm saying is absolutely correct.	A		0.51			
I express myself only if I am pretty sure that I am correct, or that it might direct my thinking to the correct answer.	A					1.85
I speak out only when I'm sure of my facts, if not, then I will not speak out.	A				2.63	
I don't usually express myself, unless it's something I know a lot about.	A					1.85
It is in my character not to express myself, I prefer to keep my opinions to myself.	A		1.02			
It is not in my character to speak out.	A				2.63	
I am a shy guy.	A					1.85
I am not a confident person. I don't like expressing my opinions and views during lectures and tutorials.	A			1.85		
I have such little confidence that I can't bring myself to justify this decision.	A		0.51			
I lack confidence, and am never totally sure of what I'm trying to say.	A		0.51			
I feel as if I do not know enough to express opinions.	A		0.51			
I am usually too nervous, plus my ideas may be totally wrong.	A					5.56
It's sometimes too intimidating an atmosphere to speak out. It dents the confidence to answer incorrectly or express an unpopular opinion at times.	A					1.85
I don't because speaking out in public is a bit of a daunting task!	A					1.85
Sometimes I think my ideas will be wrong.	A		0.51			
I can't express myself because I am too scared of being wrong.	A		0.51			
I am not always confident about my opinion, worry about being wrong.	A				2.63	
I would be embarrassed if I was wrong.	A			1.85		
My opinions always have faults, so I don't bother airing them.	A		0.51			
If I was that smart I wouldn't be a 33-year-old 2nd Year student. I am here to learn, not to listen to my own voice.	A		0.51			
I have never tried doing it.	A		0.51			
I find expressing myself very stressful.	A		0.51			
I really dislike speaking in front of groups.	A				2.63	

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I hate presentations.	A		0.51			
I am a severe introvert and have self-confidence problems.	A					1.85
I am an introvert. My parents keep me locked in the cellar when I'm not at university, but I love my mother. ***	A		0.51			
I too can memorise things.	A?		0.51			
I don't want to look 'daft' in front of others.	A		0.51			
I prefer to work on my own as this drives me more than wasting time in discussion groups. (Some are useful though!)	A/B					1.85
I am very poor at expressing my opinions, I don't do it well.	A/B					1.85
I prefer to fade into the background. Terrible, I know, but that's just me.	A/B				2.63	
I find it daunting because others seem to know more, etc. and my views/opinions seem wrong.	A/B		0.51	1.85		
Other people seem to have better arguments, so I don't express mine.	A/B			1.85		
If I have difficulty with the subject I don't risk making an idiot of myself by becoming involved. Also I am acquainted with very few students on the course.	A/B			1.85		
I am not very confident, and this causes problems.	A/B		3.06			
I am very shy and easily argued with even when I know I am right about a point.	A/B		1.53			
I am shy and don't like drawing attention to myself when it is not necessary.	A/B		0.51			
I am shy and don't like drawing attention to myself.	A/B			1.85		
I am not that confident.	A/B		0.51			
I should be more confident.	A/B		0.51			
If I know what I'm talking about then I will, but since starting university my general confidence has gone down the proverbial 'pon'.	A/B		0.51			
I am generally a quiet person and so will accept what I am told in general. If confused, I will maybe ask at the end of the lecture, though I do not mind contributing in small groups in labs/tutorials. I will only speak out if I have an opinion.	A/B		0.51			
I hate speaking in front of people.	A/B		2.55			
I get nervous in front of people.	A/B					
Sometimes I find it hard to talk or express myself in front of people.	A/B		0.51			
I like to participate in discussions etc. but only when I feel comfortable in the group.	A/B		0.51			
Instead of expressing views or opinions I prefer to learn the right material. I like a certain element of discussion as this helps in learning.	A/B		0.51			
I am confident but understand that I am still so uninformed to the biological world; I understand because there are so many us that's why Multiple-choice is the method of testing, but it seems so pointless having a 50% chance of passing anyway.	A/B		0.51			
I prefer one-to-one basis.	A/B		0.51			
I am not an outgoing person, so I don't really do that. I ask questions if I ma stuck on anything, but that's it.	A/B			1.85		
I'm extremely unconfident and if it keeps the peace I will 9/10 times keep my mouth shut.	A/B		0.51			

APPENDIX 7f continued: Glasgow University Comment categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I find that if I expressed myself as much as I could no one else would pass anything, so I shut up and let other people do some work.	A/B		0.51			
I like expressing myself when I know I am right or have a particular opinion, but feel less confident when faced with direct questioning.	A/B					1.85
Personally I don't because I always think I'm wrong, but I should be more willing to speak out because it's a pessimistic view.	A/B					1.85
I do not express myself but absorb more what others say and think about this, and mull over my own ideas.	B		2.04			
I am not confident in myself and although I have my opinions and views I prefer to hear others' before expressing myself.	B		0.51			
I prefer to listen to other people's views rather than airing my own, unless it is with people I know.	B		0.51			
I am very happy to hear others' opinions and views but am not confident in expressing my own.	B		0.51			
I think it is important to express opinions in discussions, but don't find it easy.	B		0.51			
Nobody really knows anyone, so it is difficult for this to happen.	B		0.51			
There is no point in expressing opinions because it is not appreciated. ***	B		0.51			
I know that a lot of people in my lectures, discussions, labs, etc are not interested in my opinions so I keep them to myself. ***	B		0.51			
Not everyone is supportive of a person who likes to express his or her views, fear of being mocked. ***	B		0.51			
Sometimes other students can be very dismissive of what other students have to say, just because they don't agree with them, so this discourages me. ***	B				2.63	
The tutors can be patronising it's hard to speak out. ***	B			1.85		
Some members of staff are condescending when the wrong answer is given. I fear if thus is the state of modern higher education, there needs to be a major revision of teaching standards. ***	B					1.85
Too often own opinions are poo-hooed by members of staff. Once I was told I was wrong and made a fool and a freak in front of the class. On being proved right no attempt was made to reassure my fractured ego and was left feeling disillusioned in the whole zoology subject. ***	B					1.85
I prefer not to express myself during lectures in case my ideas are shot down in flames. ***	B					1.85
I am more confident if I understand clearly what I'm talking about ('A'). I wouldn't express my view during a lecture unless I felt very strongly about it ('B/C').	B		0.51			
To an extent I'm confident in speaking out ('B/C'), but sometimes feel intimidated if I don't know much on the subject ('A').	B				2.63	
I can or cannot be confident depending on the topic ('B/C'). I need to know the full story before I can give a valid opinion ('A').	B		0.51			
I am only confident when I know what I'm talking about ('A'). If you speak you can learn from your mistakes. ('C')	B		0.51			
It can be intimidating to talk, especially if you think you may be wrong ('A') – but I believe you learn best from other people, ('C').	B					1.85
I do like to express opinions in everything except lectures ('B/C'). I am not particularly confident in myself as I usually think what I say will be wrong ('A').	B				2.63	
I find the groups large and I'm put off talking.	B		0.51			
Most of the information given in lectures is new to me and it is difficult to say whether I think it is right or wrong.	B			1.85		
Not many opportunities arise to express opinions in lectures and labs. ***	B		0.51			

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I'd be confident if I did more work. I'm just having a problem finding which I need to do most, and a lot of the time I go off at tangents as I'm interested in a different aspect and spend more time on that. Yet, if I didn't do that, why would I have taken biology in the first place?	B			1.85		
I need more confidence in talking and expressing opinions, perhaps this will come over time.	B				5.26	
I only express my opinions during labs, discussions and not in large groups because I have limited self-confidence.	B/C		2.04			
In lectures and large groups it can be difficult to speak out, but in labs/PBLs/tutorials it is easier and can be helpful.	B/C				7.89	
It's important to discuss ideas and theories – mistakes or alternatives can be pointed out. Wouldn't do it in lectures but certainly become involved in labs, tutorials and discussions.	B/C				2.63	
I am not very confident, but am willing to express my own ideas but probably more in smaller groups than during lectures.	B/C					5.56
I can express myself in small groups like labs and discussions, but find large groups intimidating.	B/C		1.02			
I find it difficult to put my opinions towards big groups but not in smaller groups where there is more chance to speak.	B/C			7.41		
To a certain extent in lectures, but more so in discussions and labs as they are there to increase your understanding.	B/C					1.85
I am confident but prefer expressing my opinions in small groups.	B/C					1.85
I am not very confident but prefer to speak during labs and discussions (not lectures) and feel more relaxed in smaller groups. It also depends on the subject.	B/C			7.41		
It is difficult in 1st and 2nd Year, but easier by 3rd Year as the classes get smaller.	B/C				5.26	
I have become more confident as I progressed through university, however I still have the overwhelming human urge that I don't want to appear stupid and embarrass myself.	B/C					1.85
Although I tend not to express views and opinions in lectures, I find it useful to express them during discussions and labs so as to use others as a sounding board for these views, and hopefully to provoke thought in others.	B/C		0.51			
I have plenty to say but in big groups I become embarrassed and tongue-tied.	B/C		0.51			
I am very confident in myself but would rather discuss my opinions with friends on a small scale and read around the subject before I openly discuss a topic I was unsure of in front of a lot of people.	B/C		1.02			
If I know people I can talk easily, but not if I do not know them.	B/C			1.85		
I find it difficult in environments where I don't know the people around me, but I do it in front of my friends.	B/C			3.70		
I express my opinions during any other time except lectures.	B/C		0.51			
I will ask questions in labs and discussions if I am not sure about something, but I don't tend to go into what I think about the subject.	B/C			1.85		
Discussions are the time and place for discussion, otherwise they disrupt the teaching of the topic.	B/C		0.51			
I like discussing my opinions with fellow students instead of wasting lecture time.	B/C		0.51			
I only express myself sometimes, depending on topic and situation.	B/C		0.51			
I am not confident in myself and prefer to listen, unless in certain subjects which I have great interest in and enjoy.	B/C		0.51			
Not so much in lectures and discussions. In write-ups, essays, and exams I think personal opinions and ability to be critical is important.	B/C					1.85
I only express myself sometimes on certain issues/topics, but on others I don't.	B/C			1.85		

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Sometimes if I don't understand something I will say, but I'm a bit shy of speaking out in front of others sometimes.	B/C					1.85
I am confident but do not always have an opinion. If so, I listen rather than talk.	B/C		0.51			
I express myself only if I feel strongly enough about what is being said.	B/C			3.70		
I prefer to speak only if I feel very strongly about something. If I'm not sure about a topic, I'll want to see what others think and I'll weigh up those ideas against mine.	B/C			1.85		
I don't like speaking out unless I strongly disagree with something.	B/C		0.51			
I like expressing myself within reason.	B/C		0.51			
I am confident in myself to a certain extent. I don't express myself for the sake of it.	B/C		0.51			
I feel if I have something to valuable to say I will. However, I find it frustrating to sit with a group of people all saying the same because each wishes to be heard.	B/C			1.85		
I am quite confident, but if I think I know something, I wouldn't be too pushy as not to seem too big-headed.	B/C			1.85		
I like to express my opinions when it is appropriate, I don't believe in shoving my views down other people's throats.	B/C		0.51			
Only when the whole class is silent because no one is participating do I feel guilty and speak.	B/C		0.51			
I am not very confident, but usually confident enough.	B/C				2.63	
I am reasonably confident.	B/C		0.51			
I am reasonably confident of my opinions.	B/C			1.85		
I am not too confident, and have confident days now and again.	B/C		0.51			
I don't mind joining in, but I'm not confident or forceful on many subjects.	B/C		0.51			
I am not confident, but willing to express an opinion.	B/C		0.51			
I do not consider myself confident, but am willing to express a view.	B/C			1.85		
I am not confident in what I know, but I don't mind being wrong or corrected – this is far better than not saying anything and never knowing the correct answers.	B/C					1.85
I am not very confident, but will try to give my opinion when I think it is the correct place and will be valued.	B/C		0.51			
I am not confident in my knowledge but I try to express views if I feel they are valuable.	B/C				2.63	
I am not very confident but I am happy to contribute if I think my point is valid and of relevance.	B/C					1.85
I am not very confident but will express opinions and views on subjects I understand or like.	B/C		0.51			
I am not very confident but do enjoy discussions.	B/C					1.85
I don't think it's confidence, but I say something with the hope that others will give me their opinions.	B/C		0.51			
Whilst not confident, I agree that one has to express their views.	B/C		0.51			
I don't express myself in lectures because that is rude. But in labs sometimes you miss something that someone else hasn't, and by discussing it you get everything right or close to it.	B/C		0.51			
I would ask questions at the end of lectures but wouldn't shout in the middle of a lecture.	B/C		0.51			

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
If I have any views or questions I'll bring them up at the end.	B/C		0.51			
I express myself but I don't interrupt the lecturer.	B/C			1.85		
You shouldn't be expected to interfere in lectures other than on grounds of being unable to see, hear, etc. But in discussions, PBLs and labs I have no problem in expressing views.	B/C				2.63	
I usually keep my ideas to myself and get on with it. However, if I am experiencing problems I will ask.	B/C		0.51			
I am mostly confident but some days brought down by being poor. Enjoy being part of student discussions, showing what I am made of. I'm a bit shy and shouting in lectures is just not done, unless it's a small clan! PBLs groups give a sense of scientific group.	B/C				2.63	
I'm quite shy, but if need be, I'll push the group forward and start a discussion.	B/C		0.51			
I like to hear others' points of view But will voice an opinion when required.	B/C					1.85
I enjoy group discussions and talking with others (but not necessarily expressing my views) as it allows us to ask for explanations of things that we don't fully understand.	B/C				2.63	
I do not exactly like expressing myself but I feel I have to. If you're interested in something you forget your initial shyness in front of others. I am confident and yet also shy.	B/C		0.51			
I don't think to express yourself you have to be particularly confident, but also that it does help. I'm very opinionated but don't always speak out.	B/C			1.85		
I am confident in what I know, but I don't like being the centre of attention.	B/C			1.85		
In a group discussion I would enter an opinion, however, other students may easily get confused if I cannot express what I mean exactly. Also some students don't participate.	B/C				2.63	
I try to ask as much as possible, but sometimes I really need to think through things and try to figure out a solution myself, before asking for help.	B/C				2.63	
I get very nervous, although I force myself to every now and then.	B/C					1.85
I have learned in many cases there is no clear right or wrong, this is where I feel confident enough to speak.	C				2.63	
It's important to be heard.	C		1.02			
I think that students should feel they can voice an opinion.	C		0.51			
It is good to put your views across and get a response from others.	C			1.85		
It is important to express your thoughts to others and hear theirs as well.	C		0.51			
I like putting my points across.	C			1.85		
Discussions make the topic more interesting, different views are heard.	C		0.51			
It gives people different viewpoints.	C			3.70		
It is important that people express their views and opinions so that others become aware of ideas, and are not confined to concepts taught in class.	C				2.63	
If I have different opinion than others or if I disagree with what's being said I let them know.	C		0.51			

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
Discussions encourage you to think on the spot about the subject. I find this very useful for learning.	C		1.02			
I like stating my opinions and ideas as I feel it helps me learn and improve.	C			1.85		
If you don't participate and ask questions you can't learn effectively.	C					1.85
It helps you learn more.	C			1.85		
Discussions are a good way to learn and exercise your brain.	C		1.02			
I find it easier to understand and learn things if I ask questions.	C		1.02			
You might as well ask questions if you don't know.	C		0.51			
The only way to find things out is to ask.	C			1.85		
I do express myself. I think by the time you get to university you should be bale to talk in discussions, or you haven't moved on from school.	C					1.85
Sometimes I talk too much! But find debate a good way to sort out concepts in my mind, provided others will express their opinions too. I hate it when people clam up in labs, etc. and simply won't speak, but what do you do!	C		0.51			
Although I am keen to participate in discussions and express my views, it is difficult to do so in such an unenthusiastic group.	C					1.85
If I don't understand why and how, I'll ask and question.	C					1.85
If I don't understand I can ask for help. Also I can explain things which I do understand.	C		0.51			
It is the only way to fully understand things.	C		0.51			
It helps you understand things better.	C				2.63	
I like to discuss things as it helps me understand when I talk problems through with others.	C					1.85
I just like to have things straight in my mind, there is no point in being confused. So one needs to ask questions.	C		0.51			
I may not always be right, but I like to put my opinions across and questions, ideas, etc. I find puzzling.	C		0.51			
I like being able to talk to lecturers, etc. to sort out problems I have with the course.	C		0.51			
It's good to debate issues as people may have thought of things you haven't.	C		0.51			
I express myself because I need to know if I'm on the right path or if I'm totally wrong.	C		0.51			
I like to have confirmation that I'm right. Not sure if I know every side of the issue.	C		0.51			
I contribute my opinions to see if others share my opinions.	C				2.63	
I am not afraid to speak whether wrong or right. I learn from both.	C					3.70
I like to say my opinions to see whether they are correct or not.	C					1.85
There is no point in keeping quiet because I might be wrong.	C		0.51			
It is important to share ideas and help others and help yourself as your ideas may be wrong.	C		0.51			
If it's wrong them I'll be put right.	C		0.51			
There is no point in staring at the wall without doing anything.	C		0.51			
Sometimes in discussions I feel like I have something to offer.	C		0.51			

APPENDIX 7f continued: Glasgow University Comment Categories – Part 2 Question 6

Q6: I am very confident I can pass this course. / *I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc.* **COMMENT**	**Position**	**Level 1**	**Level 2e**	**Level 2l**	**Level 3**	**Level 4**
I like expressing myself because I'm extremely clever and think other students would learn from me. (!)	C		0.51			
I like shouting and am very opinionated. (!)	C		0.51			
I have very strong opinions and don't mind speaking out even when I'm wrong. I also use a lot of opportunity to learn. If I don't speak out, I might miss a lot. I might also spend lots of time researching something that would have required a short answer.	C				2.63	
In 3rd Year I have found the opportunity to do this and never found it a problem.	C		0.51			
I am confident in myself in that I am willing to ask questions and contribute in debates, but not to the extent where I believe all I say is correct.	C					1.85
I am a confident person anyway. Talking about course-related information gives you even more confidence in what you are studying.	C				2.63	
I am confident in my ability to take or give constructive criticism of points of view from both lecturers and peers.	C				2.63	
I believe that I am very confident in myself and I believe that I take part in discussions, lectures, labs, etc.	C				2.63	
I feel I am able to contribute to any discussion, but I, as yet, will not have the full idea without communication with other students. I worry other students do not contribute to discussions and are therefore excluded.	C				2.63	
I am confident and don't mind speaking out, but many do and get very stressed over this aspect of the course.	C					1.85
If people disagree, so what? Justification is part of the learning process – everyone's opinion matters, however it can be an intimidating experience for many.	C					1.85
I am not afraid to speak out.	C		0.51			
I can speak as long as I have something relevant to say.	C			1.85		
If I have something to say, I'll say it, either a valid input or question.	C					1.85
I have spent half of my life reading, the other half airing my opinions and reading.	C		0.51			
I am confident, and my confidence increases even more when I am knowledgeable about what I am talking about.	C		0.51			
I would like more PBL sessions.	C		0.51			
I think more should be done to make the course more interactive.	C		0.51			
I like to contribute my knowledge and views/opinions to the group I am working with.	C		0.51			
It is important to question the ethics of science.	C		0.51			
Self confidence is vital, and also a skill that needs to be developed.	C		0.51			
I do enjoy discussing new and interesting science developments.	C		0.51			
I don't get embarrassed or too nervous. I think it is necessary for practice talks, seminars, etc. to be included in courses.	C					1.85
I think it is important for students to speak out as they are the ones who want to better themselves through an education, and a Degree will affect the rest of their lives. So they must ensure they can help in running their course as efficiently as possible.	C		0.51			
Sometimes even wrong ideas are interesting.	C				2.63	
I am very bossy and everyone else in my family is too, so I learnt to shout at an early age.	?			1.85		

APPENDIX 8

Raw Frequencies for the Different Options the Students in the Groups Followed from Level 1 to Level 3 Chose over the Three Years - Part 1

APPENDIX 8

OPTIONS SELECTED BY STUDENTS FOLLOWED FROM LEVEL 1 TO LEVEL 3 IN PART 1 OF QUESTIONNAIRE

YEAR	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Student 1											
1	3	4	2	4	4	4	3	4	1	2	3
2	4	4	3	4	4	5	4	5	3	3	4
3	4	4	3	5	4	5	4	4	3	2	4
Student 2											
1	3	4	5	5	5	5	5	5	5	3	4
2	4	4	5	5	4	3	4	4	4	2	1
3	3	4	4	4	4	4	4	4	4	3	3
Student 3											
1	5	4	3	5	5	3	2	4	3	1	5
2	5	4	5	5	5	5	5	3	2	3	5
3	5	4	5	5	4	3	5	3	3	2	5
Student 4											
1	4	5	4	5	5	5	4	5	5	4	5
2	5	5	5	4	4	4	5	5	4	3	5
3	5	5	5	4	3	5	5	5	4	3	4
Student 5											
1	4	3	4	5	5	5	5	5	3	2	5
2	4	4	2	4	4	4	5	5	2	2	5
3	5	4	4	4	4	5	5	4	2	1	5
Student 6											
1	4	3	4	4	3	5	2	4	2	3	4
2	4	3	4	4	3	5	4	5	2	2	4
3	4	4	4	4	3	4	4	4	2	2	4
Student 7											
1	4	3	4	4	3	3	4	4	3	2	3
2	3	4	4	4	4	4	4	4	3	2	4
3	4	4	3	4	3	4	4	4	3	3	3
Student 8											
1	-	-	-	-	-	-	-	-	-	-	-
2	2	4	5	5	4	5	5	3	3	3	5
3	2	5	4	4	3	4	4	5	3	2	5
Student 9											
1	1	3	3	4	3	5	2	2	1	2	5
2	3	4	4	4	3	4	4	2	2	2	4
3	4	3	3	3	3	5	5	4	3	1	4
Student 10											
1	4	3	4	4	3	4	3	4	2	3	5
2	5	4	2	3	3	3	4	4	3	2	4
3	4	4	3	4	3	5	4	5	3	1	5
Student 11											
1	5	3	5	4	4	4	1	5	4	2	4
2	5	5	5	5	5	5	5	5	4	1	4
3	4	4	4	4	3	4	4	4	3	2	4

APPENDIX 8 continued

OPTIONS SELECTED BY STUDENTS FOLLOWED FROM LEVEL 1 TO LEVEL 3 IN PART 1 OF QUESTIONNAIRE

YEAR	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Student 12											
1	5	4	4	4	4	4	4	4	3	3	5
2	5	4	4	4	4	4	4	4	4	2	4
3	5	4	4	4	4	4	4	4	3	2	4
Student 13											
1	4	4	2	4	3	4	2	4	3	2	3
2	3	5	2	3	4	4	4	4	4	2	4
3	4	4	3	4	3	4	3	3	4	2	4
Student 14											
1	4	4	3	3	4	4	4	3	3	2	3
2	4	5	4	4	4	4	4	4	3	3	4
3	4	4	3	4	4	4	4	4	3	2	4
Student 15											
1	5	3	4	4	3	4	3	4	1	2	5
2	3	4	4	4	4	4	5	4	2	2	4
3	4	3	4	4	3	5	4	4	2	2	4
Student 16											
1	5	5	4	5	4	5	5	5	3	3	5
2	4	4	4	5	4	5	5	5	3	2	4
3	5	4	4	5	4	5	5	5	4	2	3
Student 17											
1	4	4	4	3	5	5	3	5	4	2	5
2	-	-	-	-	-	-	-	-	-	-	-
3	3	5	4	1	5	5	5	5	4	2	5
Student 18											
1	3	3	3	3	3	3	3	3	3	3	3
2	5	3	4	4	5	3	5	5	1	3	3
3	5	5	5	4	4	1	5	5	3	1	5
Student 19											
1	4	5	3	5	4	5	4	5	3	2	3
2	4	4	3	5	4	4	5	5	4	2	4
3	5	5	5	5	4	4	5	4	4	2	3
Student 20											
1	4	3	3	4	3	4	4	5	4	3	4
2	4	4	3	3	2	3	4	4	4	2	4
Student 21											
1	5	5	5	5	5	5	5	5	5	5	5
2	5	5	5	5	5	5	4	5	5	2	5
Student 22											
1	4	3	2	4	4	4	2	4	2	2	5
2	4	2	2	4	3	4	4	4	2	2	4
Student 23											
1	5	4	4	3	3	4	5	4	3	3	4
4	5	4	4	4	4	4	4	4	2	2	4

APPENDIX 8 continued

OPTIONS SELECTED BY STUDENTS FOLLOWED FROM LEVEL 1 TO LEVEL 3 IN PART 1 OF QUESTIONNAIRE

YEAR	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Student 24											
1	5	5	4	4	5	4	5	5	2	3	5
2	4	5	3	5	5	5	5	5	4	3	4
Student 25											
1	4	4	3	5	4	4	4	5	3	3	4
2	5	4	4	5	4	4	5	5	3	3	4
Student 26											
1	4	4	4	4	4	4	4	4	3	3	4
2	5	5	5	4	5	5	5	5	3	4	4
Student 27											
1	4	4	5	5	4	4	3	4	3	2	5
2	3	5	5	3	4	5	5	4	3	2	3
Student 28											
1	4	3	4	4	3	5	5	4	4	3	5
2	4	4	2	5	3	5	4	5	4	1	4
Student 29											
1	4	4	4	2	4	2	4	5	3	2	5
2	4	4	4	4	4	5	5	3	3	3	4
Student 30											
1	4	4	2	3	4	4	3	4	2	2	4
2	4	4	2	4	4	4	4	4	4	1	4
Student 31											
1	5	4	2	3	4	3	3	4	5	1	5
2	5	4	4	5	4	4	5	5	3	2	3
Student 32											
1	4	3	2	4	4	4	3	3	1	3	2
2	4	4	4	4	3	4	4	4	2	2	3
Student 33											
1	3	3	4	4	4	5	2	3	3	3	5
2	5	5	4	5	4	5	5	4	3	3	4
Student 34											
1	3	4	5	5	4	4	5	4	3	1	4
2	4	4	4	4	4	4	4	4	4	2	4
Student 35											
1	4	5	4	5	5	4	3	4	4	4	5
2	5	4	4	4	5	5	4	5	3	2	3
Student 36											
1	5	3	4	5	2	5	2	4	2	1	5
2	4	4	4	5	4	5	4	4	4	2	4
Student 37											
1	4	3	5	4	3	5	5	5	4	4	5
2	2	4	4	4	3	4	3	4	1	1	5

APPENDIX 9

Responses from the Group Followed from Level 1 to Level 3 (Part 2)

APPENDIX 9

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.

	Agree	Disagree	COMMENT
1.1	TRUE		The information given should be enough to get a basic pass. For higher grades outside knowledge should be required.
1.2	TRUE		All information for a basic pass should be provided. By adding your own information you should be able to get the highest mark.
1.3	TRUE		To get the best grade, i.e. 'A', you need increased outside knowledge. But if you know all lectrure material you should be able to get a good grade. Not everyone will have the same external knowledge.
2.1		TRUE	You need to study from books as well and look at different books not just one, as well as looking at notes from lectures.
2.2		TRUE	You need to go home and read your lecture notes again and read the relevant chapter in the book also.
2.3		TRUE	The lecturers mostly only give you the skeleton of the topic in question, it is up to you to build it up and use that information when answering exam questions.
3.1		TRUE	Individual research is important as simply learning lecture material.
3.2		TRUE	They should be expected to research in their own time, to gain additional information.
3.3		TRUE	You should back up the information given in lectures with other information.
4.1		TRUE	I disagree with this because more than absorbing inform,ation is required. You have to abe able to work things out independently from the information provided instead of just reproducing what someone else has taught you.
4.2		TRUE	The students who put in the time to do their own research will not be rewarded for the extra work.
4.3		TRUE	They should be encouraged to get involved in researching material.
5.1	TRUE		The exams are based on the lectures, therefore, if you learn what is taught, you are likely to pass.
5.2	TRUE		Exams mainly test on what you get in the lectures.
5.3	TRUE		The lecturer teaches you the main things you need to know, therefore if you learn this you should get a good grade. However, you should also look at books as it can help you understand things taught in the lecture better.
6.1		TRUE	You have got to really think about why the answers are logical - not just accept that they are.
6.2	TRUE		It's up to the student if they want to research the subject more than what's in lectures.
6.3	TRUE		It's difficult to covey your opinions in exam conditions.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.

	Agree	Disagree	COMMENT
7.1		TRUE	Extra learning is required and lectures don't cover everything.
7.2	TRUE		Although extra reading helps, lectures are the most important for getting the idea of what you need to know.
7.3		TRUE	Although sometimes tests inlcude questions on subjects not even briefly mentioned.
81.	TRUE		This is what they ask for in the exams.
8.2	TRUE		What the lecturer teaches us, is what he/she wants us to know.
8.3	TRUE		This is really the only thing they can grade us on, although have to show some background information.
9.1		TRUE	A lot of the questions from exams are from subjects mentioned in lectures, but not gone into enough detail to be able to answer questions from notes alone.
9.2	TRUE		Not with an 'A' grade, but should pass.
9.3		TRUE	Continuous assessment should play a part in grades.
10.1		TRUE	It is important to do independent study and discover facts for themselves from books.
10.2			
10.3	TRUE		Students able to study all class work well enough to 'absorb' it and regurgitate in exams should definitely receive a good grade, they have proven their ability to study well. However, maybe for an excellent grade more background work could be studied.
11.1		TRUE	They should read the books given as well to get background information and use that as well.
11.2		TRUE	More interesting to get further information from books as well.
11.3	TRUE		I think too much information given is unfair because there is too much to learn.
12.1		TRUE	Lectures give an introduction to a topic and it is up to the student to study further.
12.2			
12.3		TRUE	Students should be encouraged to expand on information given in lectures themselves.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.

	Agree	Disagree	COMMENT
13.1	TRUE		I know that this question is posed to get us to write that we need to really think for ourselves, but the main basis of this should be taught material (plus labs).
13.2	TRUE		To get an EXCELLENT grade you must do a lot of your own thinking and develop your work, but particularly with short question exams it seem quite unfair to be tested on material we have not even been pointed to.
13.3	TRUE		Need to have a basis common to all students for your answer.
14.1		TRUE	Exams usually have questions which require the student to use what they have learnt to solve problems, not just to recite.
14.2		TRUE	Good grades are achieved through an UNDERSTANDING of the work and good exam technique.
14.3			And labs and essays.
15.1		TRUE	Some additional information may be needed to completely understand the lecture material.
15.2		TRUE	If this was the case then University would simply churn out graduates who although knowledgeable concerning the facts would have none of the skills required for future scientific careers.
15.3	TRUE		Not just lectures, etc. BUT grade shouldn't depend much on outside information (see comment 5)
16.1		TRUE	Often questions in exams require more than just regurgitating facts. Sometimes it is necessary to use learned information in problem solving questions.
16.2		TRUE	In order to fully understand a course, the student must also learn in their time.
16.3	TRUE		Although it is probably possible to get a good grade by memorising everything in lectures, to actually understand the course more background reading is required.
17.1	TRUE		Lecturers give the minimum information needed for a pass - if you learn it you will pass, but to do really well you need to look at other sources.
17.2	TRUE		To get a top grade you should have to find own information. To get average grade just learning lecture material is enough. It is difficult to know how much more to learn.
17.3	TRUE		Lecturers should give all necessary information to get a reasonable grade, otherwise there is no point going. BUT to get the BEST grade extra reading is probably necessary.
18.1		TRUE	A first year course should be a foundation. Regurgitation of facts needs little understanding.
18.2		TRUE	Regurgitation of learned material stifles analytical thought.
18.3		TRUE	Not exactly science, is it? Don't want exams to be outside what we've learnt at lectures but course work should stimulate thought, not rote learning.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.

	Agree	Disagree	COMMENT
19.1	TRUE		I think enough information should be given in lectures to easily pass the test. Perhaps some marks should be given for background reading and understanding.
19.2	TRUE		A good grade should be possible solely from lecture material. Extra work/reading should be the difference between good and very good grades.
19.3	TRUE		They should get a good grade (B/C), but a extra marks should still be given for extra reading and thinking.
20.1		TRUE	This is needed but other information sources such as labs are available.
20.3	TRUE		Lecturers should teach what they are going to test.
21.1	TRUE		Most of the information in lectures will be examined on although you can't rely on the lectures alone.
21.3		TRUE	They need to expand on the lectures to fully understand the topic.
22.1		TRUE	Other sources of information should be also used to back up lecture notes.
22.3		TRUE	Further reading should be required.
23.1		TRUE	Information given in lectures does not cover the entire course, but helps you to understand certain concepts.
23.3	TRUE		It should be possible to get a good grade simply from course information, however, better grades should show those who have expanded their reading.
24.1			
24.3	TRUE		
25.1		TRUE	It is harder to absorb information if you are just told it - you need to back up the information with your own learning.
25.3		TRUE	Extra reading helps in absorbing information you get from lectures and can be very interesting.
26.1		TRUE	Students should do background reading about the topics, formulate their own opinions and reflect this in how they answer exam questions.
26.3			Should go beyond lectures, but students should still be able to pass on lectures and references given.
27.1		TRUE	I find that I learn more if I have to read around some of the topics.
27.3		TRUE	Background reading is always needed to back up what the lecturer tells you.

APPENDIX 9 continued
UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams.

	Agree	Disagree	COMMENT
28.1	TRUE		To a certain extent, however, some extra work is needed.
28.3		TRUE	This should be the basis but we should have to put the information into various working contexts.
29.1	TRUE		Most exams look for actual information, so this may be enough to pass but to get a good mark you have to fully understand the information given.
29.3	TRUE		It's hard to know what is required if we are not given the information to learna dn study.
30.1		TRUE	It is better to understand information given in lectures, so that in slightly different cases, questions can be understood, and completed correctly.
30.3	TRUE		If the course is covered in lectures it gives students a much better chance of doing well in exams.
31.1	TRUE		I agree with this because if someone works hard at anything they should do well at it.
31.3	TRUE		A lot of material is studied during lectures. A student who can relay this information deserves a good mark.
32.1	TRUE		The lecturers should give clear pointers to what will be tested so that if very good marks are wanted background reading needs to be done.
32.3	TRUE		They should get a good grade but to get a better grade they need more information.
33.1		TRUE	The information from the lectures should be enough to pass but not easily.
33.3	TRUE		The lectures should contain enough information to get a good grade.
34.1		TRUE	You need to learn how to evaluate information and find out facts yourself.
34.3		TRUE	Although this does depend entirely on how one defines a good grade, if one is looking for a high pass (1st or 2:1) then extra reading should be necessary, although should also be hinted of throught the course.
35.1		TRUE	Often extrapolation is needed or working from sources, and often lecturers actually say, "Read this bit of that book.."
35.3	TRUE		A good grade yes. But to obtain top grade further reading should be necessary.
36.1		TRUE	It is up to the student to reinforce what the lecturers have taught them and expand on it.
36.3		TRUE	I believe students need to have a very good understanding of the subject before they can become competent in their field.
37.1	TRUE		
37.3	TRUE		The lectures are the main bulk of the course along with PBLs and labs, so therefore exams should be based on this, otherwise what is the point in attending these things.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 2: Students could improve their learning if they worked more with their fellow students and not just confined themselves to lecture notes.

	Agree	Disagree	COMMENT
1.1	TRUE		Extra information and viewpoints can be obtained.
1.2	TRUE		Lecturers give only skeleton of knowledge. Students should expand their own knowledge in order to get the highest mark.
1.3	TRUE		Hearing different points of view and other people will know different things and so expand your knowledge.
2.1	TRUE		It is good to get help from fellow students and helps you understand and learn by asking someone else's opinion.
2.2	TRUE		Working with fellow students does help but you need to balance between learning yourself and then discussing it with friends.
2.3	TRUE		Working with friends and fellow students gives you the opportunity to hear their opinions and allows you to understand the topic better.
3.1		TRUE	Freedom could be a bad thing as it might encourage laziness. I think some pressure is need to motivate students.
3.2	TRUE		Working with others would help students if they were not sure of a particular idea.
3.3		TRUE	Students don't have to work with other students to do well.
4.1	TRUE		If students were given more time to confide with others then it is more likely that they would absorb ideas and develop their own. Also, students should be able to choose what they need help with, not just what the lecturer thinks is important to stress.
4.2	TRUE		It prepares them for working life.
4.3	TRUE		Encourages the sharing of opinions and helps learning.
5.1		TRUE	You need lectures to keep on track of what you are doing.
5.2	TRUE		It is easier to remember things you discuss, than just things you read.
5.3	TRUE		Discussing things helps you clarify things you are not sure of and also helps you remember things better.
6.1	TRUE		Working with others helps you understand.
6.2	TRUE		It helps your communication skills and with subjects you may need help with.
6.3	TRUE		Two brains are better than one.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 2: Students could improve their learning if they worked more with their fellow students and not just confined themselves to lecture notes.

	Agree	Disagree	COMMENT
7.1	TRUE		To an extent. It may be more helpful to be able to discuss more and ask more questions.
7.2		TRUE	It depends on the student.
7.3		TRUE	Everyone has different ways of studying. If they wanted to do this they should with their friends.
8.1	TRUE		Cooperation enables you to get information.
8.2	TRUE		To hear other people's views helps me to evaluate my own knowledge and remember things.
8.3	TRUE		It is good to hear other people's opinions, and if you hear somethig it is easier to remember than when you just sudy facts.
9.1	TRUE		It's often difficult to gauge whether you are on the right track in your way of thinking about some topics, learning other people's opinions helps.
9.2		TRUE	
9.3	TRUE		It is useful to hear others' opinions on topics, and by discussing things it makes them easier to understand.
10.1	TRUE		
10.2	TRUE		If a student doesn't understand a certain aspect of their studies, it is easier, less formal to talk to another student who does understand it and can explain it.
10.3		TRUE	Students could end up getting extremely confused and misguided by consulting with other students, especially if they don't understand the topic.
11.1	TRUE		They could ask lecturers about any difficulties they have.
11.2.	TRUE		They learn other students views and learn to express their own.
11.3	TRUE		It's easier to remember stuff with other people and you can ask them things you don't understand.
12.1			
12.2			
12.3	TRUE		Students can improve learning by discussing topics with each other.
13.1	TRUE		Different kinds of learning are useful, and collaboration helps you see if you are 'on track'. It can also make learningless dull (more interesting).
13.2	TRUE		You can read and reread your notes without really knowing whether you're absorbing/understanding everything. Discussion can clear things up and make learning less stiffled, more relaxed.
13.3	TRUE		Groups are good.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 2: Students could improve their learning if they worked more with their fellow students and not just confined themselves to lecture notes.

	Agree	Disagree	COMMENT
14.1			Students need freedom to study, but they also require a bit of shove in the right direction and a kick start.
14.2	TRUE		The more one communicates, the more one learns.
14.3	TRUE		Two minds are better than one.
15.1	TRUE		If a student doesn't fully understand a piece of information other students or lecturers could help.
15.2	TRUE		Working with others often stimulates learning through seeing the subject from a slightly different perspective.
15.3	TRUE		Able to get better understanding and remember easier if concentrate more and discuss with others.
16.1	TRUE		Often deadlines and assessments detract from what the course is actually about and can make the learning process a chore rather than an enjoyment.
16.2	TRUE		Listening to other points of view broadens your own thoughts and ideas, seeing things from different angles helps you to understand it better.
16.3	TRUE		Discussing ideas helps you understand them.
17.1		TRUE	Most students COULD do better although they would need to be very self-motivated. It would be more likely that the students would not learn better.
17.2	TRUE		Other opinions can be very helpful making you think about something in a new way. Other people may have taken down different things in their notes which you didn't think were important at the time.
17.3	TRUE		By discussing a point you can see it from other angles, getting greater insight. It also helps you learn and understand.
18.1	TRUE		To a point. Unsupervised study could lead to misconceptions.
18.2	TRUE		To a certain extent. Pooling of ideas works most of the time, but there's always someone who'll be dragging his ass.
18.3		TRUE	Far too much emphasis placed on group-learning. People such as Medell worked alone and it didn't do him any harm. In the real world a team are just the team leader's (laheys???).
19.1	TRUE		Interaction is important in learning.
19.2		TRUE	I am better at learning alone. Discussions with other students are helpful but I need to learn alone.
19.3			It's good to work in groups sometimes but the majority of my study is carried out alone.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 2: Students could improve their learning if they worked more with their fellow students and not just confined themselves to lecture notes.

	Agree	Disagree	COMMENT
20.1		TRUE	You need to be guided towards things you will be examined on.
20.3	TRUE		Possibly, but this allows wrong ideas to come to light.
21.1	TRUE		Students could learn by doing with guidance from lecturers.
21.3	TRUE		It's good to hear others' points on the same topic.
22.1	TRUE		This gives students a chance to discuss notes and come to their own conclusions.
22.3	TRUE		Can pool all information together and hear others' points of view.
23.1		TRUE	Students already have a certain amount of freedom with their work in their own free time, lectures and labs, etc, are a vital part of the course and very useful.
23.3		TRUE	Notes from other students can be misleading as note-taking and abbbreviations vary.
24.1	TRUE		
24.3	TRUE		
25.1	TRUE		Getting ideas of other students can help with some more difficult idea, especially if you haven't fully understood them in lectures.
25.3	TRUE		Having information explained in different ways helps me to understand a topic.
26.1	TRUE		Pooled ideas give a wider knowledge of a topic.
26.3	TRUE		Pooling knowledge means everyone ends up with more informed views.
27.1		TRUE	This is done already and is a good idea.
27.31	TRUE		Working with people helps you cover larger topics in shorter times and also learn new ideas about a topic, which you may not have thought of yourself.
28.1	TRUE		Helps to discuss things with others.
28.3	TRUE		Discussing the lecture topics helps improve our understanding.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 2: Students could improve their learning if they worked more with their fellow students and not just confined themselves to lecture notes.

	Agree	Disagree	COMMENT
29.1		TRUE	We need to know what to learn. There is no point learning one subject deeply when there may only be one 1/100 questions on it worth one mark.
29.3	TRUE		It's good to get different views and see things from other angles.
30.1	TRUE		Some lecturers can go so fast, the subject goes over my head.
30.3	TRUE		Sometimes group work id good for problem solving, however, I find it easier to revise alone.
31.1			Some students find this helpful, others do not. I think students should be given the choice.
31.3	TRUE		Students in a group can discuss topics that each have learned separately and thus learn new topics.
32.1	TRUE		This allows views to be exchanged.
32.3	TRUE		It's good to hear how other people think and learn, as it helps open thinking.
33.1	TRUE		Other people's opinions broaden your own.
33.3	TRUE		Gaining the views of others can help you better understand a topic.
34.1	TRUE		
34.3	TRUE		It often helps to understand how someone else understands a given situation in order to see it in a different light.
35.1			Undecided, a degree of direction is needed. Also I'm a lazy bugger, and without lectures I don't know if I'd the necessary work.
35.3	TRUE		Working with other students gives a fuller picture of what is learnt if all parties contribute fully then it is a very productive scenario.
36.1	TRUE		They will be able to have things explained to them which will help them remember.
36.3	TRUE		This way, you can get others' opinions and can see things more clearly, if from several different explanations.
37.1	TRUE		By working with lectures and fellow students if a student doesn't understand something it can be discussed in a small group without the person feeling embarrased or confused.
37.3	TRUE		By working with other students it can help to clear up topics that I don't understand and it can show how much I actually know.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 3: Learning byseeing connections between ideas is more effective than absorbing isolated facts.

	Agree	Disagree	COMMENT
1.1	TRUE		Understanding the process helps to memorise the facts.
1.2	TRUE		By seeing connections you can work out the facts. It broadens your understanding.
1.3	TRUE		Easier to remember all parts when formed in pattern in memory.
2.1	TRUE		Connections can help you build a story in your head as opposed to learning a list of facts - aids memory.
2.2	TRUE		Making connections between different topics allows your brain to categorise the information therefore recall is a lot easier.
2.3	TRUE		Making connections enhances the learning process making 'mind maps', for example, allows you to understand topics better, and if you understand, learning is easier.
3.1	TRUE		Connections might be more effective because they allow patterns to emerge therefore making facts easier to understand.
3.2	TRUE		Connections make it easier - whereas straight facts can be monotonous and dull to learn.
3.3	TRUE		Sometimes isolated facts mean nothing.
4.1	TRUE		This is better because what you memorise may or may not come up in the exam. However, if you learn the connections between ideas, then no matter what you are asked you should be able to work out the answer.
4.2	TRUE		It develops skills in learning and not just in memorising.
4.3	TRUE		Explains why and what these ideas are and helps memory in the long run.
5.1	TRUE		You are able to understand what you are learning, therefore, making it easier to remember.
5.2	TRUE		During exams questions may be asked in a round about way, therefore, it is better to understand what you are talking about.
5.3	TRUE		If you forget a certain fact, you can work it out if you know certain connections.
6.1	TRUE		Having it clear in your mind is better than the facts just sitting isolated.
6.2	TRUE		It helps you store facts in your memory if they are connected to each other.
6.3	TRUE		It helps your memory by association.
7.1	TRUE		A full explanation to how the idea can be justified usually helsps in the understanding and remembering.
7.2	TRUE		Memorising facts is difficult if you can't see any link or if it's just an out-of-the-blue fact.
7.3	TRUE		Understanding helps learning.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 3: Learning byseeing connections between ideas is more effective than absorbing isolated facts.

	Agree	Disagree	COMMENT
8.1	TRUE		Easier to memorise something you have both learned about and seen.
8.2	TRUE		Get a broader view of your knowledge - makes you UNDERSTAND what you are taught.
8.3	TRUE		Have something to put information in context with.
9.1	TRUE		It's easier to remember a few connections than a lot of facts.
9.2	TRUE		
9.3	TRUE		If you learn a connection, from that you can work things out, rather than having to learn a lot of facts.
10.1	TRUE		Memorising facts is tedious and doesn't encourage students to study. Seeing connections is more effective, less boring and more thought provoking.
10.2	TRUE		Easier to learn. Boring to learn lots of isolated facts.
10.3	TRUE		Isolated facts can be forgotten and may not even be undertsood in the first place. By finding relationships easier to understand and remember and can apply it to other things.
11.1	TRUE		Because then you can learn and understand better.
11.2	TRUE		Makes you understand it better and easier to remember.
11.3	TRUE		It makes you remember things easier.
12.1	TRUE		It allows students to apply what they have learned and understand it properly.
12.2			
12.3	TRUE		Helps you to remember facts.
13.1		TRUE	Biology seems to be a subject where, unlike others, there seem to be few patterns and connections, though having learnt to see them, it probably would be easier.
13.2		TRUE	When all our exams are based on short questions, it is not practical to work out the overall design of things - you are not being asked how well you grasp the connections/scheme but the right answer to a proposed fact.
13.3	TRUE		Helps understanding, but also need to memorise stuff to get the marks.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 3: Learning byseeing connections between ideas is more effective than absorbing isolated facts.

	Agree	Disagree	COMMENT
14.1	TRUE		It should help to understand the information.
14.2	TRUE		This gives you more than one road to your destination.
14.3	TRUE		If you reach a conclusion in several different ways, you can be more sure it's right.
15.1	TRUE		Memory works better if ideas are linked.
15.2	TRUE		Learning by seeing connections facilitates a deeper understanding of the subject as a whole.
15.3	TRUE		Easier to put in Long Term Memory and recall if patterns and connections.
16.1	TRUE		If isolated facts are simply memorised, the individusal will be unable to apply what they have learned to real-life situations.
16.2	TRUE		To memorise facts is not the same as understanding them. In order to be successful in your field of study you must understand it.
16.3	TRUE		If ideas make sense to you it is easier to remember them.
17.1	TRUE		If ideas are connected you can remember a small thing which leads on to the rest.
17.2	TRUE		Can give you a line of thought and knowing relationships can help you understand.
17.3			
18.1	TRUE		All science is interconnected at some degree. Specialisation is for later study.
18.2	TRUE		But not exclusively. See facts as islands connected by a network of ideas and clarification.
18.3	TRUE		Yes, but to a point, still need a base of factual knowledge.
19.1	TRUE		I mainly agree with this, patterns and relationships when apparent or pointed out, are a useful learning aid.
19.2	TRUE		
19.3	TRUE		Sometimes 'facts' are proved wrong, the important thing is to be able to understand mechanisms or systems.
20.1	TRUE		It is easier to memorise the patterns than raw data.
20.3	TRUE		Seeing connections gives better understanding.
21.1	TRUE		Related facts are easier learnt than statements of facts.
21.3	TRUE		Learning the reasons for the facts occuring is more helpful than learning just the facts themselves.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 3: Learning byseeing connections between ideas is more effective than absorbing isolated facts.

	Agree	Disagree	COMMENT
22.1	TRUE		If you understand the information, you are also more likely to be able to memorise it.
22.3	TRUE		Looking for patterns makes remembering things much easier.
23.1	TRUE		Memorising facts you don't always understand what you are learning, by seeing connections between ideas you have a better chance of understanding the subject.
23.3	TRUE		It is easier to remember things if you understand them and can see where things connect.
24.1	TRUE		Because then you can see the links, and see where the ideas come from.
24.3	TRUE		
25.1	TRUE		Memorising facts is much more difficult. If you see connections between ideas you are more likely to remember all the ideas.
25.3	TRUE		If you see connections you don't have to learn everything.
26.1	TRUE		Isolated facts are difficult to memorise accurately and relating topics makes the subject more interesting and therefore easier to learn.
26.3	TRUE		Students can't learn everything, can only memorise through understanding, therefore link ideas.
27.1	TRUE		This allows you to have a basis for the facts, allows you to understand the importance of them.
27.3	TRUE		When things begin to link together, this is what starts getting the facts in your head.
28.1	TRUE		Know from experience.
28.3	TRUE		Otherwise facts are forgotten very easily.
29.1	TRUE		If you know the in's and out's of a situation then it is more likely to stay in your mind and the facts become common sense rather than a shaky memory.
29.3	TRUe		Things stick in your mind more if you can understand the facts all around the issue.
30.1	TRUE		A chain of thoughts is easier to memorise, as the way they fit together reminds you of the next fact.
30.3	TRUE		If you understand and can link facts it will obviously be easier to learn them.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 3: Learning byseeing connections between ideas is more effective than absorbing isolated facts.

	Agree	Disagree	COMMENT
31.1	TRUE		This helps you to remember it if you actually know what it means in relation to other subjects.
31.3	TRUE		Single facts are difficult to remember but using connections as a learning device is very useful.
32.1		TRUE	I find facts easier to learn and I can see the connection for myself.
32.3	TRUE		They let you see how things are linked and worked out if you get the facts then you might be able to wprk it out from it's connection to other things.
33.1		TRUE	I've got a good memory, though learning connections reinforces the ideas with understanding.
33.3	TRUE		Once you know the connections it is easy to work through them from the start, it is much easier to simply forget an isolated fact.
34.1	TRUE		If you only memorise facts they cannot be applied to anything else whereas if you look at connections in ideas it lets you learn more.
34.3	TRUE		On the whole it is better to able to connect ideas although this could be reflected more in exams where the chance 'fogetting' of a seemingly unimportant fact can lead to severe work-droppage.
35.1	TRUE		Just learning facts won't give you an overall understanding of the concept.
35.3	TRUE		Being aware of fluid models and the interactions they have between them is a better way of learning in biology.
36.1	TRUE		Making connections is good because things trigger other things.
36.3	TRUE		Can then use these connections to find other ones.
37.1	TRUE		If you see connections then it will help the overall understanding of a subject.
37.3	TRUE		It is much easier to see connections and apply them to different situations as this is more important for the future.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning.

	Agree	Disagree	COMMENT
1.1	TRUE		All information should be given.
1.2	TRUE		Lecturers should provide all information for a basic pass but should encourage the students to evaluate the knowledge and expand it.
1.3		TRUE	Lecturers should provide all information and guide students into increased learning for a better grade.
2.1	TRUE		You need to go and get the information from the book as lectures are just the skeleton, you ned to build on the bones and muscles.
2.2	TRUE		You are really given only half of the information you need in lectures, you need to read the relevant books also.
2.3	TRUE		Lecturers point out main facts in lectures, possibly some conflicting views but the idea is for you to find the rest of the information for yourself, again enhancing understanding.
3.1	TRUE		They should provide basic information but additional information must be left to the individual student.
3.2	TRUE		They should give us in the right direction, but it is up to the student to take responsibility.
3.3	TRUE		They provide basic information for students to expand on.
4.1	TRUE		I agree because it is better to teach students how to look for information ourselves because when we go looking for job, employers will expect us to. Also, all scientific facts are outdated and so we have to be able to update them.
4.2	TRUE		This allows students to decide on their own beliefs and develops particular interest in the subject.
4.3	TRUE		It would take too long for lecturers to teach all the material and this would also overwhelm the student.
5.1			I think lecturers should give information on all the topics, but do not need to go into depth as this can be researched by the student.
5.2	TRUE		You are meant to get more information from books - the lecturer just gives you the main points.
5.3	TRUE		
6.1	TRUE		It's not school, we have to think for ourselves.
6.2		TRUE	Students should be allowed to learn as much (or as little) as they want off their own back.
6.3	TRUE		Talking to an experienced scientist helps a developing mind.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning.

	Agree	Disagree	COMMENT
7.1	TRUE		It is up to the student to put extra effort into research ideas given to them so they understand.
7.2	TRUE		To some extent, it's good to read extra information as sometimes it is put in a different way that helps you understand better. References are good though.
7.3	TRUE		Although, same as 1st question (sometimes tests include questions on subjects not even briefly mentioned).
8.1	TRUE		It is impossible to learn everything through lectures only - need background information.
8.2	TRUE		You mostly learn what the lecturers tell you, but they guide you to go deeper into the subject.
8.3	TRUE		The lectures should count most, but extra reading is needed for getting a critical view on themes.
9.1	TRUE		Students should read more about the topics, but it's often difficult to know how much more you need to do.
9.2	TRUE		
9.3	TRUE		Students should do their own reading on the subject, but should follow lecturer's leads so that they do not study the wrong things.
10.1	TRUE		They must prompt students to be independent.
10.2	TRUE		Yes, this is true, but important that they cover ALL material which will be in exam even if only quickly.
10.3	TRUE		Being a university student is about being independent and thought provoking. Thier interest in a subject should be stimulated by lectures, not just simply handed to them in a plate.
11.1	TRUE		Students should read the book references as well to get additinal information.
11.2	TRUE		Students should read the book references as well to get additinal information.
11.3	TRUE		University is about thinking for yourself, therefore this would give us a chance to do our own research.
12.1	TRUE		I think university education should be about learning to research subjects for yourself.
12.2			
12.3	TRUE		Lecturers should help guide students in the type of information that they should be learning.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning.

	Agree	Disagree	COMMENT
13.1	TRUE		But they must provide the students with the basis of this knowledge. Most students are too lazy to do much work they don't have to, though, so it needs to be quite basic!
13.2	TRUE		Pointing us to other information sources and explaining how best to use them is good.
13.3	TRUE		Yes, but need to give a basis for that, can't examine on material not covered.
14.1	TRUE		The guiding should be in the form of an outline of all the information.
14.2			
14.3			It's nice if the lecturer at least tells you what you are going to be examined on.
15.1	TRUE		They give a basis for further study around the same subject area.
15.2	TRUE		Univeristy should produce graduates who are able to think about a subject and not just know a set of facts within limited boundaries.
15.3	TRUE		Guide them to other information.
16.1	TRUE		If a lecturer guides students in the right direction, they are more likely to find things out for themselves, thus developing skills in research.
16.2	TRUE		Lecturers should highlight the important points in a course and supply the students with the relevant page references etc.
16.3	TRUE		
17.1	TRUE		
17.2	TRUE		If they tell you what to learn it is fine, but otherwise you may learn in too much/ not enough detail depending on sources utilised.
17.3	TRUE		It would be impossible for lecturers to give ALL the information, but a broad impression is good. Giving references for recommended reading if you wish is always handy.
18.1	TRUE		If you can't think for yourself you will discover nothing.
18.2	TRUE		If everyone was lead by the hand no research would ever be undertaken.
18.3	TRUE		Yes. but more guidance needed. And please, no more £60-£80 books on the reference list.
19.1		TRUE	I think the bulk of the required learning should be included in lectures.
19.2			
19.3	TRUE		There is often not enough time in lectures to complete a topic. Lecturers should provide a basis for further study into a topic.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning.

	Agree	Disagree	COMMENT
20.1	TRUE		You get information from labs and the course text and the media.
20.3	TRUE		Need to point out what is to be learnt.
21.1	TRUE		Have to find out information and learn facts themselves.
21.3	TRUE		Helps the students think for themselves.
22.1	TRUE		Extra information should be obtained from more sources.
22.3	TRUE		They should outline the facts, but point us towards more reading for further understanding.
23.1		TRUE	Lecturers are not there to give all the information required, they are however there to guide students in their learning.
23.3	TRUE		However, lecturers should give suitable references and guidelines as to how much detail they require.
24.1	TRUE		But they should still point them in the right direction.
24.3	TRUE		
25.1	TRUE		If we are just told all the information we need to know, we won't learn how to find appropriate information when we need to, e.g. for writing essays.
25.3	TRUE		Some guidance is necessary otherwise we could just be absorbing all the wrong information.
26.1	TRUE		Lecturers should guide students, as in illustrate what topics should be learnt and in how much detail. Students themselves should obtain this detail.
26.3	TRUE		BUT students should be informed to what levels they are required to sudy subjects.
27.1	TRUE		More learning comes from having to find out things for yourself as lecture notes are not always read.
27.3	TRUE		Enough information shsould be provided by lecturers so that students can follow it in oeder to do work.
28.1	TRUE		Extra reading is needed around the subject.
28.3	TRUE		Thsy should give us a sound basis on which to study.
29.1	TRUE		Lecturers give us a basis of what we should know. It is up to us to investigate the topic.
29.3	TRUE		Lecturers should give basics. aims and objectives of course; then lead to other sources of info. Lectures are not a good way of absorbing information.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 4: Lecturers are not there to give students all the information they need, but are there to guide them in their learning.

	Agree	Disagree	COMMENT
30.1		TRUE	Lecturers should make sure subjects are covered thoroughly.
30.3	TRUE		Most work should be covered, however, extra reading, etc. should be expected by students.
31.1		TRUE	I think a lecturer should give out all the information and then leave it up to the student to study it in greater depth.
31.3	TRUE		Genetics is such a wide and varied subject that a lecturer can't discuss it all in lectures.
32.1	TRUE		The lecturer should motivate students to get infromation for themselves, so that they aren't reliant on just the notes.
32.3	TRUE		They are just signposts pointing students in the direction they need to learn.
33.1	TRUE		They should give enough to pass, but extra work should be encouraged to broaden the student's knowledge.
33.3	TRUE		Lecturers should provide the base and direct learning.
34.1	TRUE		It is important that lecturers should make you want to find out more.
34.3	TRUE		If we can't find our own way in the scientific world after four years of university then it's all a waste.
35.1		TRUE	If a student approaches a lecturer and asks specifically for certain information, it would be rude for the lecturer to refuse.
35.3	TRUE		What kind of thinkers would we be after university if we needed to be spoon-fed everything?
36.1	TRUE		They give references and facts - it is up to us to consolidate this.
36.3	TRUE		I like to do things my way, read certain things and learn in a certain way.
37.1	TRUE		Students need to read up on ideas in textbooks and think some ideas out for themselves.
37.3	TRUE		Some learning should be from the individual but an input from lecturers is also important.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 5: Examinations should be confined only to what was taught.

	Agree	Disagree	COMMENT
1.1		TRUE	To get a basic pass you should only know what was taught. Extra knowledge = extra marks.
1.2	TRUE		Everyone has the chance of knowing everything for the exam. Extra marks given for extra knowledge.
1.3		TRUE	You should be able to get a good grade knowing all that is taught but only get an 'A' with extended knowledge.
2.1	TRUE		You need to have a plan of what to learn.
2.2	TRUE		It is only fair that questions in the exams are based on what you know.
2.3			Disagree to a certain extent but because there is so much information to take in for exams there should be a restriction on the questions asked.
3.1		TRUE	Some extent of general knowledge must be tested.
3.2	TRUE		Sometimes there are questions in the exams slipped in and we haven't covered them in the course. They should stick to most of the ideas taught.
3.3	TRUE		I have experienced exam questions where sneaky questions were included. This isn't very nice.
4.1		TRUE	I disagree because we should be gaining practice at learning more than what is set down to us, as this will be expected in our honour years.
4.2		TRUE	This results in students lacking in their own techniques in information and problem-solving.
4.3		TRUE	Doesn't encourage the student to express their own opinions and findings.
5.1			Don't know because you may learn extra information, but if it is not what the examiner is looking for then you will lose marks. There would need to be boundaries to how much you need to know.
5.2	TRUE		People may find different extra information from books - what one person finds important, another may not - so I think testing on extra information would be too much.
5.3	TRUE		People may differ in what extra information they think is important.
6.1		TRUE	You're trying to churn out the great minds of the future not a flock of sheep which all know exactly the same things.
6.2	TRUE		If it's not in or related to lectures then some students my have unfair advantages over others.
6.3	TRUE		As Q1(it's difficult to convey your opinions in exam conditions.)
7.1	TRUE		To an extent. It is unfair to be expected to know completely unrelated extras.
7.2	TRUE		There is a huge amount of other reading that could be done and it is unfair to expect us to know what to pick out and learn.
7.3		TRUE	Although, same as question 1(Sometimes tests include questions on subjects not even briefly mentioned.)

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 5: Examinations should be confined only to what was taught.

	Agree	Disagree	COMMENT
8.1	TRUE		All students should stand a fair chance - even those who do not do extra work.
8.2	TRUE		When marking exams lecturers love to read what they have taught. So this is important.
8.3		TRUE	Should be most important, but some other extra reading should be needed.
9.1		TRUE	Merit should be given to those who put the extra effort in.
9.2			
9.3	TRUE		It is unfair to examine the students on facts not covered in lectures/labs, because then they have not idea what to study in such a huge topic.
10.1	TRUE		Students are nervous enough at exam time and studying required facts in itself is hard enough. Extra questions can sometimes fighten students in exam situation that they could cope with outside exams.
10.2	TRUE		With all other subjects a student has to study for, it is better for them to know what will be asked for from them, otherwise they may have only a vague knowledge and can end up spending time studying irrelevant material that may not even be in the exam.
10.3	TRUE		It's difficult enough to study for exams with the given relevant material, never mind having to cope with lots of new information. By including questions relating to new untaught information can lead to great confusion especially under exam conditions.
11.1	TRUE		Some students don't have time to memorise all the information in the book as well as the lectures.
11.2	TRUE		Fairer - no questions where it hasn't been covered in the lectures.
11.3	TRUE		It isn't fair if stuff turns up that was not covered by lecturers.
12.1		TRUE	They should be designed to encompass what was taught but should allow the addition of further knowledge.
12.2			
12.3		TRUE	Students should be able to expand on knowledge which has been taught to them.
13.1	TRUE		It is difficult otherwise to know what you should and shouldn't expect to know, and gives too much advantage to those with extra background.
13.2			Don't know, seems unfair to base it on things not covered as we might have studied extra, but not that thing, but initiative/own work should be rewarded.
13.3	TRUE		See above. (Can't examine on material not covered.)

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 5: Examinations should be confined only to what was taught.

	Agree	Disagree	COMMENT
14.1	TRUE		Students shouldn't need to know any more information, but they should be required to show their understanding.
14.2	TRUE		Only if you are also taught to use what you know to solve problems.
14.3			What's taught plus what's on the reading list.
15.1	TRUE		The extra knowledge may need to be specified, not necessarily taught. Extra study could be done in so many areas, specific knowledge on one subject that may turn up would make studying impossible.
15.2		TRUE	Although exams should stick mainly to what was taught some scope for proving one's knowledge to closely related topics should be given.
15.3	TRUE		Not everyone can get access to other books and information relevant to courses, so some will have unfair advantage.
16.1		TRUE	Although I don't think exams should test on completely new or unconnected areas, questions which require the student to use the knowledge they have learned to an extent into other related topics are a good aidea.
16.2	TRUE		I agree that exams should not contain material that is not part of, or related to the coursework.
16.3			Exams should be based on topics introduced by lecture course/labs but can expand beyond the basics of what was taught. Completely new topics should not be introduced in an exam.
17.1			
17.2		TRUE	MAINLY, but some questions could be from recommended reading.
17.3	TRUE		We CANNOT be expected to cover everything so it would be unrealistic to ask random questions. I think it would be better to ask questions on things we have been taught and to give extra credit for information includede which wasn't taught.
18.1	TRUE		I believe a better method of examination needs to be found.
18.2		TRUE	Within reason. Exams are stressful enough without any really nasty surprises.
18.3	TRUE		Within sensible limits, yes. No point in attempting to weed out the slachers at this late sage, they'll be found out soon enough in industry.
19.1	TRUE		I sort of agree with this, but some background reading should be required.
19.2			
19.3			The questions should be based on what was taught but credit should be given for further reading into the subject.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 5: Examinations should be confined only to what was taught.

	Agree	Disagree	COMMENT
20.1	TRUE		The exam provides a basic knowledge that everybody should know. You cannot examine people on things they do not know about.
20.3	TRUE		There is a lot of things that could be learnt. Students do not have time to absorb everything, only important facts that the lecturer outlines - even if this is to point to areas of textbooks.
21.1	TRUE		Extra knowledge concerned with the learnt topic to expand their understanding of the topic.
21.3	TRUE		Exams have limitations or they could be on anything.
22.1		TRUE	This only tests a student's ability to memorise, not understand.
22.3		TRUE	To get more than a pass, students should be able to give additional information from textbooks etc.
23.1		TRUE	Exams should cover any/all parts of the course guide, not only what was covered in lectures.
23.3		TRUE	But the majority of the paper should be of things that were taught. Questions on what wasn't taught show those that have expanded their reading and should therefore show better grades.
24.1			
24.3	TRUE		There is such a wide area, that the exam should just examine what was taught, but also have the option for adding things that were learnt in your own time.
25.1		TRUE	Extra knowledge may be useful in later yaers and it is better to have too much knowledge than not enough.
25.3		TRUE	Testing on extra facts shows a good understanding of the topic.
26.1	TRUE		It's unfair to expect students to have studied the specific background on a topic that an exam question may require as they have looked in more detail at a different part.
26.3		TRUE	Should test students further. Brighter students will learn beyond what they are taught.
27.1	TRUE		This is true to some extent as what was taught is used as guidelines for study.
27.3	TRUE		Topics covered are what should be examined, but not the exact words uttered by the lecturer. Extra reading should be tested to an extent.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 5: Examinations should be confined only to what was taught.

	Agree	Disagree	COMMENT
28.1	TRUE		People could all have extra knowledge, but it could be different knowledge.
28.3	TRUE		People could do different extra reading.
29.1			I think that there should be enough marks given for taught knowledge to pass the exam but to get an excellent mark extra knowledge should be tested.
29.3	TRUE		The possibilities for exam questions could be huge if they were not based around what was taught. It would be impossible to study for all possible questions.
30.1	TRUE		Exams are to test on ceratin areas of study. Theses areas should be stuck to.
30.3	TRUE		If you weren't taught it you may not have covered it, therefore exams should stick to lecture content.
31.1	TRUE		If something is not taught a student cannot be expected to know it - unless they have been told to study it!
31.3	TRUE		Exams should be based on the topics that are taught, not precise lectures.
32.1	TRUE		It should be close and very relevant to the subject tested so that everyone has a chance of answering it.
32.3		TRUE	
33.1		TRUE	They should be set as to the course objectives.
33.3	TRUE		Exams should not include stuff totally out of context, they should be on what was taught, but allow the student to expand on what was taught with information they have founs themselves.
34.1		TRUE	It is difficult to know how much extra knowledge should be learned, and exactly what should be known.
34.3		TRUE	Although what was taught should form the majority of the examined material, students should be given the opportunity to show their knowledge in broader terms.
35.1		TRUE	I disgaree, only it is known widely what 'area' of knowledge is to be examined.
35.3	TRUE		What is taught should include extra reading losts or topics on which further research is needed.
36.1		TRUE	We need to be told what we need to know or we won't know what to study.
36.3	TRUE		Yes, but also on related subjects that were mentioned and for which references were given (extra reading round subjects should be done).

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 5: Examinations should be confined only to what was taught.

	Agree	Disagree	COMMENT
37.1	TRUE		If they were to display extra knowledge it would be getting away from the objectives of the course.
37.3	TRUE		It is not fair on students who attend labs, tutorials, lectures etc if this inbformation is not examinable. Other learning should just be a bonus.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 6:I am very confident that I will pass this course. / I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. (First question answered at Year 1 only)

	Agree	Disagree	COMMENT
1.1	TRUE		Information is easy to understand.
1.2	TRUE		I need to know if I'm on the right path or if I'm totally wrong.
1.3	TRUE		
2.1	TRUE		If I do the work and hand it on time and refer to my book and visit the library to find out additional information and just don't use lecture notes.
2.2	TRUE		If I have a different opinion than others or if I disagree with what's being said I let them know.
2.3		TRUE	However I am confident and express my opinion whenever I fully understand what is being discussed depends on situation.
3.1		TRUE	I am not completely confident as I am having difficulty with some aspects of it.
3.2		TRUE	I usually keep my ideas to myself, amd get on with it. However, if I am experiencing problems I will ask.
3.3		TRUE	I like to keep my opinions to myself as I often feel intimidated by confident people who are more likely to be correct.
4.1	TRUE		I agree because I know the work and read more textbooks than is stated. Also, the web-site is very helpful and provides a lot of information, allowing me to gain experience researching certain topics.
4.2		TRUE	Not everyone is supportive of a person who likes to express their views, fear of being mocked.
4.3		TRUE	Don't always feel confident enough to express opinions unless certain they are right.
5.1	TRUE		
5.2			I would ask questions at the end of lectures but I wouldn't shout out in the middle of a lecture.
5.3			I will express my views in labs and discussion groups, but I don't like doing that in lectures.
6.1	TRUE		I think so.
6.2	TRUE		I just like to have things straight in my mind, there is no point in being confused.
6.3	TRUE		If it's not the right opinion I'd rather I was corrected, it's better than just sitting there.
7.1	TRUE		I enjoy doing Biology and hope this will help in my ability and willingness to learn.
7.2	TRUE		I like to get involved in discussions as it helps and improves knowledge to question and listen to others.
7.3	TRUE		Not quite as blunt as that, but if I have an opinion, I would not be afraid to express it.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 6:I am very confident that I will pass this course. / I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. (First question answered at Year 1 only)

	Agree	Disagree	COMMENT
8.1	TRUE		I find it interesting.
8.2		TRUE	I absorb more what others say and think about this.
8.3		TRUE	Do not like to speak when many people around.
9.1	TRUE		I'm finding the coursework okay to cope with.
9.2		TRUE	Prefer one to one basis.
9.3		TRUE	I am a confident person, but I am not confident enough about my own knowledge to express my opinions and defend them.
10.1	TRUE		I really enjoy biology and feel I WANT to pass rather than NEED to.
10.2			
10.3	TRUE		I am confident enough to put forward my opinions if I feel I'm qualified in what I'm saying and enjoy doing so.
11.1	TRUE		I think if I study hard enough I will pass.
11.2		TRUE	I generally am too shy to express my opinions.
11.3	TRUE		It is better to do this and express initiative than staying quiet.
12.1		TRUE	I still have more exams to do, don't want to tempt fate.
12.2			
12.3		TRUE	
13.1	TRUE		Because I do my work and I'm clever.
13.2	TRUE		Yes! I like shouting and I'm very opinionated!
13.3	TRUE		I'm dead loud.
14.1	TRUE		If I keep working.
14.2		TRUE	I am an introvert, my parents keep me locked in the cellar when I'm not at Uni, but I love my mother.
14.3			Listen to what's said, then form your own opinion.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 6:I am very confident that I will pass this course. / I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. (First question answered at Year 1 only)

	Agree	Disagree	COMMENT
15.1		TRUE	I find some of the course work confusing and am constantly ill - passing this course is already a challenge.
15.2	TRUE		Although I tend not to express views and opinions in lectures, I find it useful to express them during discussions and labs so as to use others as a sounding board for these views, and hopefully to provoke thought in others.
15.3		TRUE	Have difficulty remembering everything but do express opinions I am sure of.
16.1	TRUE		I enjoy the course and am interested in what I am learning.
16.2			I like to express my opinions when it is appropriate, I don't believe in shoving my views down other peoples' throats.
16.3		TRUE	Lecrtures aren't the right environment for discussing opinions.
17.1	TRUE		I have attended all lectures and read background information. I have attended all labs and handed in all assignments - complete and on time.
17.2		TRUE	I am very shy and easily argued with even when I KNOW I am right about a point.
17.3	TRUE		I have found that the timetable this year has included more opportunities to do this which has increased my confidence.
18.1		TRUE	I'm never confident.
18.2		TRUE	If I was that smart I wouldn't be a 33year old 2nd year. I am here to learn not to listen to my own voice.
18.3		TRUE	Not a chance, if I'd wanted to form a discussion group, I'd have gone for social science.
19.1	TRUE		I did well in the last modules and I'm finding the present modules OK.
19.2			
19.3		TRUE	I am reasonably confident in SDL's and labs, but would not feel confident abswering a question in the lecture theatre.
20.1	TRUE		I feel that I am learning enough to pass my exams.
20.3		TRUE	I'm not confident, but expressing opinions can be good.
21.1	TRUE		I am putting the effort into learning the given topics and researching them myself.
21.3	TRUE		

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 6:I am very confident that I will pass this course. / I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. (First question answered at Year 1 only)

	Agree	Disagree	COMMENT
22.1	TRUE		As long as I continue to understand lectures and research further.
22.3		TRUE	I am never confident I have my facts straight.
23.1	TRUE		If I study hard enough I'm capable of passing this course.
23.3	TRUE		
24.1	TRUE		
24.3	TRUE		Most of the time - Unless there are super confident people in the group that know all the answers and you seem quite thick in comparison.
25.1	TRUE		I have already completed an A-level in biology, so a lot of the material is not new to me.
25.3		TRUE	I am unsure of a lot of my opinions. Some times I feel I don't have the facts to back them up.
26.1	TRUE		This course is very passable assuming the required work is done.
26.3	TRUE		I can express myself in labs and discussions, but I've never expressed an opinion in a lecture.
27.1	TRUE		I have passed modules A & B with A's. I'm finding the work okay, if I do a bit of extra work then what is expected.
27.3	TRUE		Not a lot of this is ancouraged during our course.
28.1	TRUE		Done okay so far!
28.3		TRUE	I hate having to discuss facts in large groups, however I don't mind discussing my opinions.
29.1	TRUE		Might be big headed, sorry. I'm putting enough work in: attend all lects. & labs, take thorough notes and back these up using the textbook. Also take interest in what is happening in the world related to my course: sheep cloning, plant genetic engeneering
29.3	TRUE		I'm not scared to voice opinion, you don't get anywhere if you don't make yourself heard.
30.1	TRUE		I intend to pass the course with study.
30.3		TRUE	I like to express my opinions at the appropriate times, however, lectures should not involve student opinion.

APPENDIX 9 continued

UNIVERSITY OF GLASGOW - Level 3 (followed) Part 2 Results

Question 6:I am very confident that I will pass this course. / I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. (First question answered at Year 1 only)

	Agree	Disagree	COMMENT
31.1	TRUE		If I work hard at the course there should be no reason for me not to pass it.
31.3		TRUE	I am not as confident in my ability asI would like to be.
32.1	TRUE		I have background knowledge of the subject, I go to all the lectures and I do reading in my own ttime.
32.3	TRUE		I like people to give me feedback on the way I think.
33.1	TRUE		I enjoy biology and find it quite straightforward.
33.3	TRUE		Maybe not so much during lectures, but definitely during any form of discussion.
34.1	TRUE		I feel I have been doing enough work - I think I deserve to pass!
34.3	TRUE		I know I am, I've seen it.
35.1	TRUE		Coz I'm great me (or smart) (I hope).
35.3	TRUe		I am a loud mouth and don't mind discussing my opinions even if not easily accepted.
36.1	TRUE		I understand the material.
36.3	TRUE		It may be a bad habit, but I think I am right! I do, however, listen to others and understand their points of view.
37.1	TRUE		I did well (A's) in first exam so hopefully if I can continue in that way I should be able to pass.
37.3		TRUE	Sometimes I'm not sure whether my view is valuable and I somet imes have difficulty expressing my opinions.

APPENDIX 10a-f

The Responses of Staff to Part 2

APPENDIX 10a: GU Staff Comment categories – Part 2 Question 1

Q1: In tests and exams, a good grade should reflect nothing but the students' ability to process in an effective way what was taught in class. **COMMENT**	**Position**	**Percentage**
It depends on the question.	B	1.67
In a good class not only facts but also independent thinking should be taught and encouraged, and a fair test should only assess what is taught.	**B/C**	1.67
At L3 and L4 students should be expected to draw on ideas and information they have discovered themselves, but at L1 and L2 this is less expected.	**B/C**	8.33
In L1 and L2 only taught material should be assessed and good grades be awarded if it is given. In L3 and L4 lecture material should give good marks, excelling requiring more.	**B/C**	3.33
I do like students to know what was taught in class, but give good credit to those who show evidence of independent study.	**B/C**	3.33
In some areas (L3 and L4) students should know the facts and display independent and sophisticated understanding, but not need to 'process' anything.	**B/C**	1.67
At L3, a good grade should be based on lectures only, while an excellent grade should require more. For L4, even a good grade should require more.	**B/C**	1.67
There is a big difference between 'should' and what actually happens, especially at L1 we are very constrained by time and numbers, and it is easier to base most assessment on what has been taught. Assessment is based more on students' broader skills at higher levels.	**B/C**	1.67
At L2, it is impractical to expect a lot of extra work outside the lecture course. However in an ideal situation, I disagree.	**B/C**	1.67
Processing taught material effectively is reflected in moderate marks, while doing more results in excelling (L3 and L4).	**B/C**	1.67
In L3 and L4 we expect the student to show good evidence of additional reading., use of CD ROMs, etc, and this should be rewarded well.	C	10.00
Students should only achieve a good grade if they show additional ability (to think, apply, organise information, interpretation of data and argue)	C	6.67
Students should not ignore what is taught, but there has to be a balance between this and much more from outside.	C	3.33
At any level of university education a student should show independent thinking, assessment of knowledge and dogmas independently, and should be reading around the course material.	C	3.33
Some difficult topics may be best approached by careful thinking rather than more reading, but in general students should go beyond what is actually presented in class.	C	3.33
This is Higher Education – this question shouldn't even be asked.	C	3.33
Even at L2, there should be room for the students' own thought, and this should be essential at L3 and L4.	C	3.33
A good grade should reflect the students' ability to understand principles, not memorise facts.	C	1.67
What is taught in class will mostly be out of date quickly, so students should learn more 'outside'.	C	1.67
Evidence of independent work (i.e. independent of what was explicitly 'taught'), quality of the response to study material directed by lecturer, novelty, should all contribute to attaining a 'good grade' (L4 more so than lower levels).	C	1.67
Students need to demonstrate an understanding of wider issues, and connections between courses.	C	1.67
In L3 and L4 students need to do some independent study and interpret their knowledge.	C	1.67
There should even at L1 be some evidence of students' reading, this should increase as they progress to L2, 3, and 4.	C	1.67
This would be too restrictive, it denies the value of other modes of learning (outside 'class').	C	1.67
Students must be able to acquire information and insights for themselves.	C	1.67
Top grades should be awarded to good answers that contain additional, coherent information.	C	1.67
This is only one aspect of what should be tested, many students have strengths in other areas.	C	1.67

APPENDIX 10a: GU Staff Comment categories – Part 2 Question 1

Q1: In tests and exams, a good grade should reflect nothing but the students' ability to process in an effective way what is taught in class. **COMMENT**	**Position**	Percentage
It is regrettable that as things are, this is largely true for L1, and even worse that this is expected in L3 and L4 to get grades as high as a 2(I), and only for a 1st to require more.	C	1.67
Exams should give students the opportunity to do more.	C	1.67
Students need to show understanding and critical approach.	C	1.67
Independent study and analytical/problem solving abilities should be encouraged from the start.	C	1.67
A good grade should be for some evidence of constructive thinking (L4).	C	1.67
At least in L3 and L4 students should have opinions.	C	1.67
Students should be able to organise information in different ways. They should be able to give priority to some information over others.	C	1.67
Basing exams on taught material only is demonstrably nonsense!!	C	1.67
Students have to able to apply their knowledge in unfamiliar circumstances after they have done their exam (otherwise no point in course). Facts are in books and on the Web – the ability to use these should be taught.	C	1.67
The overall answer, including students' thoughts AND English and grammar, all contribute to an understanding answer.	C	1.67
Students need to think for themselves.	C	1.67
Agree without comment	A	5.00
Neither agree nor disagree – without comment	B	1.67
Disagree without comment	C	1.67

APPENDIX 10b: GU Staff Comment Categories – Part 2 Question 2

Q2: Group work is of limited educational value in the teaching of biology. COMMENT	Position	Percentage
When 'working' in groups students tend not to participate, and weaker ones slope off leaving the group exposed.	A	1.67
Group work usually results in a few individuals doing most of the work.	A	1.67
Our students are too stupid to gain benefit from group work.	A/B	1.67
Group work is as good as the group. Some benefit, some are held back. A little is okay, but should not take over.	B	5.00
Group work is a valuable part of teaching biology, but I do think it's limited and doesn't allow for multiplicity of ways in which different people learn. I have seen examples of the 'bully syndrome' which inhibits quite nervous people from learning efficiently.	B	3.33
The extent to which students can benefit from group work, though limited, can be valuable. Students do have group work, but it's unclear how much each student benefits from them.	B	3.33
It is too difficult to say. It depends on the level, size and composition of the group, individual variation and nature of task (e.g. practical, poster, etc.)	B	1.67
The benefit of group work is questionable. For L1 students it exposes them to a range of views. For L3-L4, it depends on the composition of the group – good students usually benefit, weak ones rarely do.	B	1.67
Some forms of learning are most effectively developed in group work, but not all.	B	1.67
Everything is of limited value.	B	1.67
Even though it is more labour intensive for both staff and students, group work is a useful supplement to standard methods of teaching if carefully organised and structured.	B/C	1.67
It depends on which aspect of biology is being looked at. In some disciplines (e.g. where field work and complex lab work are involved) group work is very successful).	B/C	1.67
Students will still learn effectively from teaching. Fellow students can often correct each other more effectively than staff since they understand the (starting) level.	B/C	1.67
I hesitated here since everything is of 'limited' value, but group work is very valuable since it promotes debate about issues and reveals different ways of looking at things.	B/C	1.67
Students need to learn to work in teams and interact with each other in order to be successful in almost all careers and human activity.	C	8.33
Working in groups helps students consolidate and reinforce their knowledge.	C	6.67
Group work gives students an opportunity for comparisons and evaluation of selves and others – judging own strengths and weaknesses for improvement.	C	5.00
We are not just teaching to create scientists, but to develop more general skills (co-operation, negotiation).	C	3.33
Group work is important for fostering interpersonal skills (communication – listening and discussing).	C	3.33
Ability to work in groups is vital these days, it is an important skill, irrespective of whether it teaches anything.	C	3.33
In group discussions students are challenged to go beyond their own ideas and understanding, it broadens their perspective.	C	3.33
The tasks of simply explaining to one another things not grasped, let alone justifying own ideas are truly educational.	C	3.33
Group work stimulates discussion of issues.	C	3.33
Group work is important as it teaches transferable skills and is a true reflection of the work place.	C	3.33
Group work is effective for both poor and excellent students. Interaction with the peer group aids learning.	C	3.33

APPENDIX 10b: GU Staff Comment Categories – Part 2 Question 2

Q2: Group work is of limited value in the teaching of biology. **COMMENT**	**Position**	**Percentage**
If used carefully, group work can enhance learning and understanding.	C	3.33
Group work can be, for many, encouraging to start thinking for themselves.	C	3.33
Students get to understand better through discussing answers and listening to others.	C	1.67
I am a great believer in the value of small group discussions with presentations at the end. I use these, plus related group methods a lot.	C	1.67
Working together is motivational to students.	C	1.67
When used in the right context, this is very useful.	C	1.67
Group work is good because there is a limited amount of direct contact between students and academic staff.	C	1.67
Biology benefits from group work because of the structure of information, which can overwhelm at an individual level.	C	1.67
Groups can share the kinds of insights and lateral thinking that help them make sense of information.	C	1.67
Group work id one of the ways in which students can learn, especially when conducting lab work where groups can be much more effective than single students.	C	1.67
Group work allows students to explore ideas in a non-threatening environment, and therefore to learn from each other.	C	1.67
At L1 and L2 group work builds confidence and gets the students used to talking the language of science.	C	1.67
Often students underachieve because they have difficulties in expressing themselves. Group work can give them practice in an informal setting.	C	1.67
A well designed course should give students the opportunity to work alone and in a group situation.	C	1.67
Of course group work is valuable in teaching interactive skills, but independent work is also valuable as it develops initiative and independence.	C	1.67
Learning to work in a team is an important generic skill, like learning to write logically, speak in public, etc.	C	1.67
Group work is an excellent way of teaching. Tutorials, PBLs, SDLs, should all be encouraged. Unfortunately we don't have the resources to do this at L1 and L2.	C	1.67
This is exceptionally useful, and all feedback from employers, etc., indicates that team work is an invaluable skill to acquire.	C	1.67
Students plainly enjoy and benefit from work in small groups.	C	1.67
A group working together will have different perspectives and varying levels of understanding of the topics, therefore they can be 'teachers' as well as students in the group.	C	1.67
Students have far too little opportunity (presently) to work as part of a group. This is a valuable experience in itself. It also informs the students of the level of attainment of each member of the group, including self, of ten this is obscure.	C	1.67
Students need to listen to other arguments.	C	1.67
Experience of various formats shows potential for developing higher skills than regurgitation.	C	1.67
Agree without comment	A	1.67
Disagree without comment	C	1.67

APPENDIX 10c: GU Staff Comment Categories – Part 2 Question 3

Q3: Students should carry out the majority of their work on their own and learn how to explore all resources available to them without dependence on lecturers. **COMMENT**	**Position**	**Percentage**
I'd like to see this tried.	A	1.67
All levels – there is too low a level of practical skills for this to work in labs.	A	1.67
The literature is now so large that at L3 and L4 I think it is difficult for students to select information without lecturers to help them discriminate important from unimportant facts.	B	1.67
They need a mixture.	B	1.67
Neutral - both required.	B	1.67
Lecturers should guide and stimulate. (all levels).	B	1.67
L3 - This is two separate issues. It is essential to work alone to digest and learn (the university reckons 2 or 3 hours per lecture – I forget). Independent exploration is important to learn. Students can pass without doing much of that though.	**B/C**	1.67
This is a (?) of perfection. If resources are good enough, yes; but (?) are, and lecturers can play a role in sorting out key references.	**B/C**	1.67
That might be correct for some students, but one should strive to provide flexible conditions so that as many as possible can perform optimally.	**B/C**	1.67
Some guidance is needed from lecturers for most students. Only the best can succeed independently.	**B/C**	1.67
Students need guidance, though in decreasing amounts as they develop.	**B/C**	1.67
At least in Level s 1 & 2 students need to be given guidance and taught the resources available so they can use them later.	**B/C**	1.67
Not realistic, except with the most independent students.	**B/C**	1.67
In terms of total TIME yes, but they should expect real help on WHAT to study.	B/C	1.67
This is how the majority of our graduates will have to work in the workplace.	C	1.67
And/or in groups, again just like they will have to do in the real world.	C	1.67
Because in the 'real world' one has to know how to find information and apply it to everyday situations. It is good to have an expert source to go to, but this should be just another resource.	C	1.67
Uneasy about 'on their own' – as indicated above, groups are far better – but exploring resources without depending on lectures is essential to mature study.	C	1.67
Not sure of 'majority', but students need to be able to judge the quality and relevance of information for themselves before we add our feedback to improve their future performance.	C	1.67
To a large extent but staff do require to provide the students with information and ideas and guidelines on how best to achieve these goals.	C	1.67
I do think that lecturers have an important role. Hardly surprising from a lecturer? Presenting the basics of a subject and the key problems students need to think about seems to me sensible core functions for lecturers.	C	1.67
Lecturers should give the basic facts but as a skeleton for students to research resources and (fresh out?).	C	1.67
L 1/2 probably not majority. L4 – by this stage, perhaps, yes, - they won't have lecturers to depend on later, we should try to equip them to cope.	C	1.67
Encourage independence, but lecturers the need to teach how to access and Use available resources, (L3 & L4).	C	1.67
Obviously, really.	C	1.67

APPENDIX 10c: GU Staff Comment Categories – Part 2 Question 3

Q3: Students should carry out the majority of their work on their own and learn how to explore all resources available to them without dependence on lecturers. COMMENT	Position	Percentage
They will enjoy it a lot more, but combined with working in groups as in Medical Faculty.	C	1.67
If I though t this, I would be doing myself out of a job; students should attend lectures, but should learn to work on their own as well.	C	1.67
Agree if emphasis is on 'majority' not entirety. Obviously they need extensive help from lecturers to do many things, but need not be 'dependent'.	C	1.67
However, we must be careful to make sure the 'jump' from schools is not too great.	C	1.67
Students should, during the course of their degree, become more independent. This is part of creating a life-long learning culture.	C	1.67
We are teaching them to teach themselves.	C	1.67
Should mostly work on their own, but some co-operation can help.	C	1.67
No Comment (B)	B	3.33
Agree/C (without comment)	C	1.67
Contradictory.	?	1.67
Better for understanding and learning. But still need some lectures to provide guidance, etc. **(Q misconstrued – B/C)**		1.67
Students should use all the resources open to them including lecturers. **(Q misconstrued - C)**		1.67
L3 & L4 - Some direction is required. Biology is a complex and developing field and students often need initial guidance and re-direction. **(Q misconstrued – C)**		1.67
Lecturers are essential in setting out the main areas for study. Without them, valuable time is wasted getting bogged down in trivia. (L3 especially) **(Q misconstrued)**		1.67
Again I hesitated over the pejorative possibility of 'dependence', but having the lecturers available to provide guidance and to facilitate is important. **(Q misconstrued)**		1.67
We should facilitate and enable and encourage them to talk to each other, etc. **(Q misconstrued)**		1.67
Lecturers (or other staff) need to point out the areas of study (usually the lecture topics covered) - students can't choose what topics to study on their own especially as the lecturers are setting the exams. **(Q misconstrued)**		1.67
Lecturers are teachers. They can save the students much fruitless work by using their experience and advanced knowledge to point students in the right direction. **(Q misconstrued – B)**		1.67
It is a valuable resource to have recourse to lecturers whose experience as students of their own discipline and as teachers should be available to facilitate students' own work. (All levels) (Q misconstrued)		1.67
Need to have proper support network to be encouraged to develop independence. **(Q misconstrued - B/C)**		1.67
Lecturers essential to help point the way and get the balance correct. **(Q misconstrued – B/C)**		1.67
Poor question : Students SHOULD learn how to explore all resources, gaining independence via staff pointers. **(Q misconstrued - C)**		1.67
Students will tend to get lost without at least some guidance. **(Q misconstrued - B)**		1.67
This is a badly thought out statement. Yes, they should explore all resources but often lectures are a useful guide and assistance. **(Q misconstrued – B/C)**		1.67

APPENDIX 10c: GU Staff Comment Categories – Part 2 Question 3

Q3: Students should carry out the majority of their work on their own and learn how to explore all resources available to them without dependence on lecturers. COMMENT	Position	Percentage
Lecturers are able to guide and advice students in ways that books/CDs/Web cannot. (**Q misconstrued – A**)		1.67
Students should do a lot of work on their own, but I feel this statement underestimates the importance of lecturers. (**Q misconstrued – C**)		1.67
Again, student-centred learning, with the student finding out rather than being told make for a better scientist and a better understanding and retention. Students do Not need to learn 'on their own' however. (**Q misconstrued – C**)		1.67
They should do much of their work on their own, but lectures are an efficient means for students to become acquainted with the most important aspects of the subject. (**Q misconstrued – C**)		1.67
Agree to a large extent, but I do believe students are still learning and lecturers should be available and very willing to provide guidance when required. (**Q misconstrued – B/C**)		1.67
No – students need guidance. (**Q misconstrued**)		1.67
Interaction with biologists who have a structured knowledge of the subject is a vital part of any learning process. Test ability to reason. (**Q misconstrued**)		1.67
As above – two heads are better than one. (**Q misconstrued**)		1.67
Other students and staff should be important resources. (**Q misconstrued – C**)		1.67
This is a place for the lecturer (L3 & L4) to provide the framework/direction for other resources to embellish, add depth, etc. (**Q Misconstrued – C**)		1.67

APPENDIX 10d: GU Staff Comment Categories – Part 2 Question 4

Q4: Lecturers do not have the authority to disagree with accepted scientific knowledge, and should not confuse students with their views where they disagree with books or theories. **COMMENT**	**Position**	**Percentage**
Agree (without comment)	A	3.33
A lot depends on what is regarded as 'accepted', and on whether the lecturer has a serious alternative or is merely quibbling...	B	1.67
Must arise only rarely, on particular topics. Not a big issue.	B	1.67
What books? What theories?	B	1.67
Up to a point I agree, but it does open the door to some complete nonsense.	B	1.67
Once a student leaves undergraduate education he or she will discover, if they remain in science, that some scientific knowledge is poorly defined or even wrong. This doesn't really matter so much at UG level though.	B/C	1.67
Depends on the level of teaching. At Level 1 this confuses students, at L4 it can stimulate them.	B/C	1.67
Of course lecturers should not confuse students, they should present own opinions as opinion, not as dogma.	B/C	1.67
Attitude has to be modified to suit the students. The best will be stimulated by controversy, the weakest will only be confused.	B/C	1.67
		1.67
Students should realise that some issues are not clearly resolved and that there may not be a single hypothesis or explanation as yet.	C	1.67
I am very aware of subjecting my students to my own personal views, however, it is important for them to develop the ability to look critically at all issues, even where there is accepted dogma.	C	1.67
A lecturer is required to give a balanced view.	C	1.67
At level 4 students ought to be aware of the growth areas in science, which are often where accepted knowledge is questioned, Lecturers should state their views, but try to give a balanced presentation.	C	1.67
Students need to learn that there are a variety of views.	C	1.67
Lecturers should indicate alternative views/theories as long as they aren't dictatoral and prejudiced.	C	1.67
If this was so, you might as well just teach a textbook.	C	1.67
Try to get the students to question and think. Without questioning, they will not be able to advance science.	C	1.67
I'm wary of lecturers presenting ONLY their views. In controversial areas presentation of views is important - students should then get on with making up their own minds.	C	1.67
We cannot fit our courses into the confines of one text. May need different emphases (and different half truths). Textbook may be shallow and substitute superfluous facts for real analysis (e.g Campbell).	C	1.67
Provided one's views are based on good evidence, OK to discuss one's views as well as accepted ones.	C	1.67
Lecturers (or most of them) actually participate in producing scientific knowledge - should transmit this to students.	C	1.67
Most of us are researchers as well as lecturers, and thus do have this authority. But it is important to present a balanced view, not just one's own viewpoint.	C	1.67
If lecturers are in the frontline of research they should be discussing the latest findings and theories with students.	C	1.67

APPENDIX 10d: GU Staff Comment Categories – Part 2 Question 4

Q4: Lecturers do not have the authority to disagree with accepted scientific knowledge, and should not confuse students with their views where they disagree with books or theories. **COMMENT**	**Position**	**Percentage**
Lecturers are often those who write the textbooks. They should point out to students where their views or information differs from recommended texts (or the scientific consensus).	C	1.67
With the majority of staff conducting research, or in touch with the current research literature they do have the authority.	C	1.67
Lecturers often are, and as far as possible should be, sufficiently knowledgeable to challenge certain orthodoxies. At the very least, their own scholarship should keep them aware. (L4>L2)	C	1.67
Lecturers in Universities ARE experts.	C	1.67
Rubbish! Theories are just that, and textbooks are often wrong or dated.	C	1.67
L3 - Some of our lecturers write the books. Textbooks cannot be up-to-date in all areas.	C	1.67
Books can be wrong and often outdated.	C	1.67
How else can we educate students that sources are not infallible.	C	1.67
What extraordinary rot! If a scholar does not have the authority, (s)he has no right to seek a lectureship.	C	1.67
I have the authority to disagree with anything if I can justify my position logically.	C	1.67
All levels - The sooner students realise that scientific knowledge is not fixed or 'proved', the better - both for their overall development and as possible future scientists (but then, I started out as a physicists, and learnt about wave/particle duality and the historical development of atomic models at an early stage).	C	1.67
Lecturers often have research experience, and have the right to question accepted ideas. This is an essential part of teaching	C	1.67
Most of biology is centred around current interpretations of facts. Interpretations change, or are held differently, and students need to understand and be aware of this.	C	1.67
Most important decisions in life including those by the highest level politicians are made on insufficient evidence and affected by bias. Students should learn how to (a) deal with this, (b) avoid making the same mistakes if possible.	C	1.67
Need to show basis of scientific theories, indicate possible problems, indicate theoretical limitations.	C	1.67
Self evident - fundamental part of university education.	C	3.33
A university is a place where independent thinking should be encouraged and critical evaluation of scientific work is a necessary component of biology.	C	1.67
Should give the information needed to the students to make their own picture. (L3 + 4)	C	1.67
A scientists job is to disagree with accepted scientific knowledge and we should encourage this in our students.	C	1.67
Lecturers in biology are often authorities in their own field. As long as students are told that scientists often disagree, one strong view point is valid if explained well.	C	1.67
An important aspect of training is to demonstrate the fallibility of 'absolute fact'. However, confusion at any level should be avoided.	C	1.67
Disagree (without comment)	C	3.33

APPENDIX 10d: GU Staff Comment Categories – Part 2 Question 4

Q4: Lecturers do not have the authority to disagree with accepted scientific knowledge, and should not confuse students with their views where they disagree with books or theories. **COMMENT**	**Position**	**Percentage**
Lecturers should have the critical ability to scrutinise published material.	C	1.67
This is not a question of authority but of knowledge and reasoning. (all levels).	C	1.67
Accepted scientific knowledge does not equate with facts always. But the lecturer should make clear what is accepted and what is his/her own view and why they differ from accepted view.	C	1.67
This is where the cut and thrust of an honours degree is and what really stimulates the most able of our students.	C	1.67
There is certainly a risk that lecturers promote personal views but as long as orthodox views are also made known to the students, this should be left to the students' judgement.	C	1.67
Generally, we should try to provide clarity rather than confusion, but any researcher has a duty to challenge 'accepted' knowledge where it is poorly substantiated.	C	1.67
I do not know if they do or do not have the authority, but they should help their students to be discerning, to question scientific knowledge - evidence based learning.	C	1.67
Scepticism is great - accepted knowledge can be wrong. (L3 & 4)	C	1.67
L3 & L4 - But they must make it clear that this is at odds with accepted thought. Science is always about questioning things.	C	1.67
L3/L4 - Some theories are contradictory.	C	1.67
It is important to make students think about issues, especially where they are not black and white.	C	1.67
Lecturers must stimulate students.	C	1.67
If a lecturer disagrees they should state their view is not accepted, but SCIENTIFICALLY justify their stance.	C	1.67

APPENDIX 10e: GU Staff Comment Categories – Part 2 Question 5

Q5: The nature of biological knowledge makes it difficult to assess students using open-ended questions. COMMENT	Position	Percentage
If you're wanting fairly to grade students, you should not use open-ended questions	A	3.33
Answers that are right or wrong can be marked with 100% accuracy. Essays cannot.	A	1.67
It is usually preferable to set structured questions to avoid(minimise) answers which consist of fact-free generalisations.	A	1.67
Agree (without comment)	A	1.67
I agree up to a point.	A	1.67
It is sometimes all to easy for students to write 'waffly' answers to this type of question. These answers are difficult to assess or rank.	A	1.67
At higher levels this is true simply because there is SO much in the literature. I am a physicist originally and was used to giving precise right or wrong answers - this is often not possible in biology.	A/B	1.67
Neutral.	B	1.67
TRUE L3- I'm not sure what this is about. Questions should be open-ended or not, according to what needs to be taught.	B	1.67
Sorry, the question was to open-ended.	B	1.67
No comment.	B	5.00
What do you mean by open-ended questions?	B	1.67
What's an open-ended question?	B	1.67
I am not sure what open-ended means but if it means what I think it does then there are many questions in biology that require 'open-ended' treatment since the evidence and interpretation are debatable.	C	1.67
But some questions can be directed at interpretation or assessment.	B/C	1.67
In exams in general, due to constraints in marking time etc, definite answer questions are more appropriate. However in essays, providing the students justify what they write, open-ended topics are fine.	B/C	1.67
Though I disagree, I would like to make the point that I am not always able to use the kind of questions I would ike because of departmental directives to cut down on marking. (L2 especially).	B/C	1.67
No it doesn't!	C	1.67
Marker must be prepared for various approaches to an answer - no standard answer.	C	1.67
Need evidence of scientific approaches.	C	1.67
It can be difficult but also rewarding to get students to tackle problems without an answer.	C	1.67
Any question regarding discussion is an open-ended question. We use this all the time, especially at the higher levels.	C	1.67
Surely (at higher levels especially) we should assess students' ability to cope with the unknown or unfamiliar. Can assess ability to develop an argument, rather than counting regurgitated facts.	C	1.67
They have to be well thought out questions, but can work well.	C	1.67
Essays are the best way of assessing a student's real knowledge.	C	1.67

APPENDIX 10e: GU Staff Comment Categories – Part 2 Question 5

Q5: The nature of biological knowledge makes it difficult to assess students using open-ended questions. **COMMENT**	**Position**	**Percentage**
Students tend to do poorly in this type of Q. In my view, this is because they lack the ability to draw together strands of evidence from different areas because they tend to compartmentalise their knowledge. It is not related to the nature of the knowledge itself.	C	1.67
There are assessment problems because there may be more than one sort of good or bad answer, however, students need to explore the open-ended nature of the science.	C	1.67
On the contrary, open-ended questions, if well set, can provide invaluable insights.	C	1.67
These often reveal which students are capable of thinking for themselves, rather than simply regurgitating lecture material.	C	1.67
A good student will define the scope and organise the content - so allowing good students to demonstrate their ability to handle facts and concepts.	C	1.67
Insofar as that has any truth as regards the 'knowledge' (i.e. of mere facts), knowledge should be the crux of what's tested. Our key task is to disabuse students of the false assumption that it is.	C	1.67
Real biology is full of open-ended questions.	C	1.67
A good student writes good clear answers.	C	1.67
All levels- No more so than in any other subject I'm familiar with.	C	1.67
All knowledge is open to critical discussion, biology is no different. (L3 & L4)	C	1.67
A good students will present the basic facts clearly in their answers, as well as indicating problem areas, and their own ideas. There is a gradation of ability, so that the poorest students may (unhappily) be confused on even the basic facts.	C	1.67
At Level 4 students ought to be aware of the growth areas in science, which are often where accepted knowledge is questioned, lecturers should state their views but try to give a balanced presentation.	C	1.67
I don't see why biology is different from any other subject.	C	1.67
At 4th Year level, I strongly disagree. Open-ended questions allow students to show the depth of their knowledge/understanding and the opportunity to argue a case or compare different viewpoints.	C	1.67
As long as the student gives a sound logical argument backed up with examples, this is perfectly valid.	C	1.67
Biology is also about processes/reflection/thinking how to do things. Understanding can still be tested in open-ended questions. (all levels)	C	1.67
Biological knowledge is far from complete - it is difficult to assess students with a 'closed' question.	C	1.67
Students should be taught to think and interpret in biology, so open-ended questions are valid.	C	1.67
he added complexity of a biological dimension superimposed on the physical, makes the biological discipline an excellent system for exploring original thought.	C	1.67
Difficult - requires an open-minded approach by assessor and full justification by students. (all levels)	C	1.67
Many of the questions addressed require ethical and philosophical input.	C	1.67

APPENDIX 10e: GU Staff Comment Categories – Part 2 Question 5

Q5: The nature of biological knowledge makes it difficult to assess students using open-ended questions. **COMMENT**	**Position**	**Percentage**
Difficult but not impossible. (L3/4)	C	1.67
Difficult certainly, BUT not to be read as impossible. Just requires creative effort in setting.	C	1.67
I'm not interested in students repeating facts, rather I want them to demonstrate understanding.	C	1.67
I assume that not just 'knowledge' but also 'understanding' are being assessed, in most cases. Open questions can encourage the kind of discourse that reveals the level of comprehension.	C	1.67
Arguments presented clearly can be readily assessed.	C	1.67
Disagree (without comment)	C	3.33
Assessment IS difficult! Needs a variety of forms of assessment.	?	1.67
I don't understand this question.	?	1.67
Nothing to do with the 'nature of biological knowledge'.	?	1.67
I teach at L2. It is not the nature of biological knowledge that makes it difficult to assess students using open-ended questions, it is the large number of students that we have that makes it difficult.	?	1.67

APPENDIX 10f: GU Staff Comment Categories – Part 2 Question 6

Q6: Our courses are very successful in promoting growth in students through the years. COMMENT	Percentage
But less than previously when classes were smaller, and more contact with teachers.	1.67
I would like to think this but I have no evidence, as I do not know what happens to the students after they leave university.	1.67
Too much emphasis on rote learning.	1.67
A lot of 1st year, especially the first term, is memory. Terms 2 & 3 much more challenging.	1.67
Agreement does not imply that we can't do better! I think we rely too heavily on exams of factual information. But biology is a language as well as a science, and to discourse adequately, some basic learning is required.	1.67
Agree without comment.	1.67
Excessive assessment at L2, especially fact-based MCQs, encourages a view of biological expertise as an exam technique, not a transferable skill. Little encouragement from system to change objectives.	1.67
Not very successful, but quite successful.	1.67
Up to a point, Minister...	1.67
For best students, true, but we've a significant. Cohort of weak ones in Biology - esp. today, who don't develop. range of critical, generic, interpretative + practical skills you'd hope to see in Honours students. Courses designed to give them with opportunity to grow.	1.67
I think we are doing 'fairly well' but that is less than 'very successful'. Teach less, make student learning more independent but improve the quality of the feedback.	1.67
Unfortunately, most seem to stay the same. A few even go 'backwards'. But more optimistically, most agree thay have learnt something, and even enjoyed it.	1.67
We rarely train or test students in their ability to think for themselves - regurgitation is all that is required for many courses.	1.67
Our better students get good jobs and posts and are successful in them.	1.67
L3 - Depends very much on the student. The growth seems most apparent in L4. Many students enter L3 having acquired very little factually in L2, and leave L3 likewise. In relation to some of my teaching I am well aware of progress.	1.67
Very' may be too strong. Our HONOURS courses still do pretty well, with the upper half (or thereby) of the ability range. The 2-step transition from L2 to L4 is radical, and vital.	1.67
I agree mildly. They do not get better by 4th year.	1.67
I haven't seen every course in IBLS, but those I have are so variable that this question is almost unanswerable. Some are pretty good, some are abysmal!	1.67
Many of our students have gone on to do very well. Our Externals are almost always impressed.	1.67
There are too many students, especially poor ones, to allow the kind of individual or small group attention which develops minds. Only one degree course in IBLS provides small group tutorials (Pharmacology).	1.67
Good numbers go on to do research and those a good number get first class jobs.	1.67

APPENDIX 10f: GU Staff Comment Categories – Part 2 Question 6

Q6: Our courses are very successful in promoting growth in students through the years. **COMMENT**	**Percentage**
I really don't know! (Good luck with your project) They progress from taught work to more independent learning from L1-L4.	1.67
By the end of year 4, I feel most students are intellectually mature but more could be done to promote this in earlier years.	1.67
No comment.	1.67
We're still teaching to the (higher) standards of the intake 10 years ago.	1.67
I can't say.	1.67
Some of our honours students have done well in science.	1.67
See external examiners reports, SHEFC? reports.	1.67
It is very difficult for most staff to answer this question as generally it is only in L3 and L4 that we become familiar with students as individuals.	1.67
Yes, one does feel intellectual growth as students progress through their 3rd and 4th years (in earlier years, one tends not to know them personally). But the decline in small group teaching because of increased numbers makes this more difficult to achieve.	1.67
Some more than others. 2nd year modules are generally less challenging than other levels.	1.67
I don't think our courses are bad at this, but could undoubtedly be improved.	1.67
Just compare essay standards across years!	1.67
Too much 'spoon-feeding' particularly in Level 2. Some areas better in Level 3/4 and good innovation in Level 1 (self-study project).	1.67
Don't know.	1.67
No. I feel universities within the UK have lost the concept of 'Reaching' degrees and extended the high-school paradigm into further education.	1.67
Depends on the student!	1.67
Less at L1 than L2, L3, & L4. More mature students - greater insight to area of knowledge.	1.67
Class sizes are too large for good interactive teaching and assessment.	1.67
Students' feedback from my L4 option suggests that they are improving in ability to interpret and understand the field (i.e. the better students, the poorer students tend to want the facts fed to them and don't want to be required to think).	1.67
Our courses are successful in promoting intellectual growth of many students as many have gone on to achieve distinction in science. However, since the introduction of modules at L1&2 they have become less so than when students had integrated courses.	1.67
Not as successful as I would like, but not a total failure either.	1.67
Only in some students. I don't feel we have the resources to accommodate the best and worst students.	1.67
This is the stated ethos in Genetics and Molecular Biology degrees, and all teaching staff I have met espouse this philosophy.	1.67

APPENDIX 10f: GU Staff Comment Categories – Part 2 Question 6

Q6: Our courses are very successful in promoting growth in students through the years. **COMMENT**	**Percentage**
Difficult to quantify 'very' & extent of 'growth'. Probably our courses ALL promote SOME 'growth' in MOST people but few will experience dramatic intellectual growth. My impression is some of our courses are rather stultifying and would promote minimal growth.	1.67
Or we so hope.	1.67
Though I agree, it disappoints me that even in final year some students rely on lecture notes. (Sorry I have qualified rather than justified my decisions in the last two questions).	1.67
In L3 & L4 - I agree with this. In Levels 1 & 2, except medicine PBL, we do not help students to explore, we feed them facts.	1.67
Not able to comment - only been in Glasgow for less than 1 year. In my previous academic post I would DISAGREE with the statement - good students always do well. Average students are getting worse in intellectual development over the last decade.	1.67
Neutral.	1.67
Comments: I find the questions unhelpful and very biased.	1.67
Some are, some are not. This cannot be answered as a general question.	1.67
L1 and L2 do not promote intellectual growth enough - L3 is a big shock to students.	1.67
The progress in the demand on students to conform the original literature with each extra year on course is evidence in favour of this assertion. (All levels)	1.67
Not enough planning time in student practicals, i.e. planning their own experiments.	1.67
They are becoming less successful than a few years ago. Reasons: CLASS SIZES, teaching economies.	1.67
We give a lot of emphasis to recalling facts in exams.	1.67
Some courses are, some not.	1.67

APPENDIX 11

Raw Frequency Tables for all UB Levels (Part 1)

APPENDIX 11

FREQUENCY TABLES FOR THE DISTRIBUTIONS OF UB STUDENTS OVER THE PART 1 QUESTIONNAIRE SCALE OPTIONS

LEVEL / OPTION	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Year 1 (N=205)											
Option 1 (A)	3	4	7	18	16	2	9	8	32	88	12
Option 2 (A)	7	6	12	10	18	3	7	10	25	44	6
Option 3 (B)	23	33	31	45	87	20	24	45	77	45	35
Option 4 (C)	51	72	75	50	57	56	61	66	40	14	25
Option 5 (C)	121	90	80	82	27	124	104	76	31	14	127
Year 2 (N=151)											
Option 1 (A)	2	3	12	15	22	9	3	0	14	76	14
Option 2 (A)	10	7	9	13	13	4	5	8	12	20	2
Option 3 (B)	16	19	28	35	67	14	14	28	47	33	18
Option 4 (C)	33	43	36	32	33	37	26	40	39	14	24
Option 5 (C)	89	79	66	56	16	87	101	75	38	7	92
Year 3 (N=71)											
Option 1 (A)	1	4	2	6	5	1	3	0	3	28	2
Option 2 (A)	11	2	6	3	13	2	1	0	5	14	4
Option 3 (B)	14	8	10	14	36	3	2	7	18	17	10
Option 4 (C)	22	30	31	28	15	23	24	32	24	8	16
Option 5 (C)	23	27	22	19	2	42	41	32	21	4	39
Year 4 (N=48)											
Option 1 (A)	2	0	2	7	7	2	1	1	6	24	3
Option 2 (A)	1	0	5	7	6	2	0	1	1	6	0
Option 3 (B)	1	9	4	11	15	5	2	4	6	7	2
Option 4 (C)	12	11	18	12	7	15	11	11	14	6	8
Option 5 (C)	32	28	19	11	13	24	34	31	21	5	35

Note: The polarity in Questions 4, 6, 8, 9 and 11 has been accordingly corrected to allow for Perry categorisation.

APPENDIX 12a-f

UB Response categories (Part 2)

APPENDIX 12a

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES: Part 2 Question 1

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. COMMENT	Position	Year 1(%)	Year 2(%)	Year 3(%)	Year 4(%)
Lecturers should/do cover the syllabus, students need to know this, only this should be tested.	A	5.37	1.99	1.41	
It is the lecturer's duty to teach what will be in exams, and test on what has been taught in class.	A	3.90			2.08
Shows good application of what they have been taught.	A	1.95	0.66		
Shows good understanding of what has been taught and/or competence.	A	1.95	1.99		
Exams assess one's understanding of what was taught.	A			1.41	2.08
All or most of what one needs for exams and tests is said in lectures.	A	1.46		1.41	
Lecturers should provide enough material to ensure passing.	A		1.32		2.08
Shows good memory and makes studying easier.	A	0.98			
Learning is done for the purpose of passing exams	A	0.98			
Shows that one is a good student.	A	0.49			
Shows diligence, and should be rewarded accordingly.	A			1.41	
They would have done what they are supposed to do, studying.	A		0.66		
Lecturers teach the truth.	A	0.49			
If the lecturer teaches the truth, students should pass if they give back what he/she teaches.	A	0.49			
Passing isn't impossible if students are given enough time in exams to give back info taught.	A	0.49			
Lecturers know exam content.	A	0.49			
It is necessary to conform to lecturers' marking keys.	A	0.49	0.66		2.08
It is up to the students to revise the material given by lecturers.	A	0.49			
Right answers show that one has met the requirements of the exam.	A	0.49			
It is s good thing to do.	A	0.49			
Good introduction gives good enough knowledge to ensure passing.	A	0.49			
This gives students a fair chance to pass well.	A		0.66		
This is the way things should be.	A		0.66	1.41	
Other sources might confuse students.	A		0.66		
Lecturers do not prescribe good books for students.	A		0.66		
Lecture material not to be just absorbed, it needs to be understood as well.	A/B		0.66		
Sometimes one needs not understand, but just memorise.	A/B		1.32		
This is what should be going on in schools, but they want that here as well, so one has to give them what they want. ***	A/B		1.32	2.82	
This is what we are told should be the case, but exams show differently. ***	A/B			2.82	

APPENDIX 12a continued

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES: Part 2 Question 1

Question 1: Students should be able to get a good grade by just absorbing the information they get from lectures and giving it back in tests and exams. **COMMENT**	**Position**	**Year 1(%)**	**Year 2(%)**	**Year 3(%)**	**Year 4(%)**
No hope for one to ever become a professional scientist, lecturers are a good example for this.	**A/B**			1.41	
There aren't enough literature sources for students to do any further reading on their own.	B				2.08
They have to give the information back, but with a bit of further reading.	B	2.93	1.99	4.23	2.08
Too much material to be covered, therefore not enough time for further reading.	B	1.95	2.65	4.23	6.25
In theory, failure to expand on ideas does not show intelligence.	B		0.66		
Relieves students of the stress of too much reading.	B			1.41	
It is impossible to get everything during lectures.	**B/C**	1.46			
They should get a good grade, not an excellent.	**B/C**		0.66		
Further independent reading/research/broad thinking needed to broaden one's knowledge beyond what lecturer gives, improve understanding, or for the student's own good.	C	24.4	14.6	19.7	31.3
Lecturers do, and should only give skeletal information in class, students need to beef it up.	C	13.2	10.6	7.04	8.33
Understanding, interpretation, critical analysis, application, etc. need to be demonstrated and assessed	C	7.32	10.6	15.5	20.8
Giving back information does not show understanding or intelligence.	C	4.39	6.62	4.23	6.25
Exams also contain stuff that was not taught in class, even totally unknown material.	C	3.90	2.60		
Leads to simple memorisation, which isn't learning as it isn't challenging, hence no progress and/or mastery of subject.	C	1.95	9.27	8.45	8.33
Learning is for future application, therefore memorising for exams now won't help much then.	C	1.95	3.31	1.41	4.17
Lecturers can't possibly give all information needed in class, time too limited for this.	C	1.46	2.65		
Necessary to get information and views from other sources besides lecturer, and critique information.	C	1.46			
Learning is not just for exams, but also for inquiring about and interacting with environment.	C	1.46			
Lecturers aren't infallible, might fail to explain things well, or give irrelevant information at times.	C	0.98	1.32		4.17
Students should provide their own views and opinions to show understanding.	C	0.49	3.31		2.08
Memorised information is not easy to apply in different situations.	C	0.49	0.66		
Learning only what's in lectures makes the learning process boring.	C		0.66		
This would discourage creative thinking and encourage laziness in students.	C		1.99	1.41	
Absorbing without understanding makes the material difficult to learn.	C	0.49			
Do not need lectures only, practical work necessary to do as well. **(Question misconstrued)**				1.41	

APPENDIX 12b

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 2

Question 2: Students could improve their learning if they worked more with fellow students and not just confine themselves to lecture notes COMMENT	Position	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 4 (%)
Students easily go off-track during group discussions.	A	0.49			
Working together does not necessarily mean students work any harder.	A				2.08
Students can mislead and confuse each other as they might not have the right knowledge, but just their opinions.	A	0.98	1.99	4.23	
Lecturers should provide all the information.	A	0.49			
Some students might just end up taking others' views without thinking for themselves.	A		0.66		
Working with others would expose one's weaknesses and they might get laughed at.	A			1.41	
Even though one could get laughed at where they sound not so intelligent, working together could still be beneficial.	A/B			1.41	
Discussions should be done only after one has studied on their own.	A/B		0.66		
Working solo might be bad for one, but groups can also be useless where too much time is spent on trivia or where the whole group relies on one person.	A/B		0.66		
Wastes valuable time explaining to others when one could be doing personal research.	A/B	0.49		2.82	4.17
Some students work better on their own, but others and lecturers could be consulted in cases of doubt.	A/B	1.95	1.97		
No need to bother working with others, whatever one doesn't understand will always be in books.	A/B		0.66		
This is okay as long as the lecturers give them direction and guidance.	B	0.66			
Other students do not have time to look for information.	B	0.49			
Workload too high to allow for this.	B	0.49	0.66		
Working with others is helpful as long as discussions do not go rampant.	B	0.98			
Lecture notes might not be detailed or good enough, therefore need to be expanded on through further reading and brainstorming with others.	C	1.46	7.95	1.41	4.17
Students find it easier to understand each other than lecturers, as they think at the same level and/or use the 'same language', and have more freedom with each other.	B/C	10.7	6.62	12.7	4.17
Discussions improve understanding and knowledge attainment through sharing of knowledge, ideas, opinions, views, etc. not availed by lecturers.	C	43.9	28.5	43.7	50.0
Group work provides opportunity for comparison and evaluation of self and others, resulting in improving on weaknesses or harder working.	C	12.7	19.9	11.3	10.4
Helps identify and iron out misconceptions, errors or doubts.	C	9.27	8.61	8.45	6.25
Gives opportunity to discover others' different ways of learning and approaches to problems besides that of lecturer.	C	6.83	3.31		
Students have differing capabilities of understanding in class, hence can help each other out after.	C	4.88	8.61	7.04	2.08
Provides a forum for challenges to one's thinking, and for one to challenge others, thereby stimulating further thought and exposing other issues.	C	2.44	4.64	5.63	14.6
Easier to retain and remember what one hears from of argues out with friends, than what one hears in lectures or gets from books.	C	2.44	3.31	4.23	4.17
Group work is helpful.	C	1.95	0.66		

APPENDIX 12b

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 2

Question 2: Students could improve their learning if they worked more with fellow students and not just confine themselves to lecture notes **COMMENT**	**Position**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 4 (%)**
Working with others is more practical as students spend more time with each other than with lecturers.	C	1.46		1.41	
Group work makes the work more interesting.	C	0.98	0.66		
Group work makes the job much easier.	C				2.08
Helps one gain aspiration	C	0.49			
Trains students on the skills of communication and co-operation, needed for fitting into societal set-ups.	C		3.31		6.25
Saves valuable time as others could quickly explain things to one, instead of them spending too much time on them without understanding.	C		0.66	1.41	

APPENDIX 12c

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 3

Question 3: Learning by seeing connections between ideas is more effective than memorising isolated facts. COMMENT	Position	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 4 (%)
Students memorise things for exams only.	A	0.49			
You can't go wrong when memorising.	A	0.98			
Not necessary to see connections all the time.	A				2.08
Memorising helps, as sometimes understanding is impossible.	A	0.49		1.41	2.08
Students forced to memorise by the way things are – required to do so by system. ***	A		0.66		2.08
At university material is too difficult for one to make connections.	B			1.41	
Depends on the individual.	B	0.49			
If one can't see the connections, all one is left to do is memorise.	B	0.49			
Overload of work, so better to memorise.	B		0.66	1.41	
Memorising has to be coupled with understanding.	B	0.49			
Logical connections between ideas ensure and demonstrate more effective understanding, learning and knowledge retention than simple memorisation.	C	28.8	30.5	21.1	35.4
Easy to remember and not easy to forget ideas that are logically connected as they are easy to handle and understand (especially if there's too much to learn) compared to that which is memorised.	C	22.4	23.2	28.2	14.6
Allows for demonstration of creative thinking, reasoning and application (remembering an idea leads to access to others).	C	13.7	22.5	11.3	20.8
Having an idea of how ideas connect, one would be in a position to explain the origin of ideas and how things work logically with competence, to others.	C	4.39	3.97	11.3	6.25
One can get easily confused when memorising, while understanding makes learning easier and better.	C	2.44	2.65	2.82	
Memorising not effective at times.	C	0.98		2.82	
Too much to memorise, too much for the brain.	C	0.98	2.65		
Gives everyone the opportunity to make their own mental picture according to their own imagination.	C	0.98			
Understanding how ideas relate allows for comparing them easily when one is required to.	C	0.49			
Science is made up of connecting issues – development of new ideas depends on seeing these connections.	C	0.49	0.66		
This is an obvious statement.	C	0.49	0.66	1.41	
What one sees sticks better in the mind than hearsay **(Question misconstrued).**		11.7	5.30	19.7	14.6

APPENDIX 12d

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES - Part 2 Question 4

Question 4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 4 (%)**
Lecturers should supply students with the necessary material and help.	A	4.88	2.65	1.41	
It is their job and they are paid for it, so they should do it.	A	2.93	3.31	1.41	
Lecturers must supply students with material on which they will be tested or examined.	A	2.44	1.32		
Students' learning enhanced by information given by lecturers.	A	1.46			
Some lecturers do not do their job properly, and this would encourage laziness on their part.	A	0.98	0.66	1.41	
Only lecturers know what's to be covered, so they should supply it.	A	0.98			
If students were not taught by lecturers, there would be no control in their studies.	A	0.49			
Providing information is what education is about.	A	0.49			
Lecturers have to do both guiding and supplying information.	A			1.41	4.17
What guidance?	A	0.49			
Lecturers should supply the information, students guided by course outlines.	A		0.66		
Lecturers know all the information, and have to try by all means to deliver it.	A	0.49	0.66		
Lecturers should teach the students and know all their problems.	A	0.49			
Lecturers should not assume students know the material, they must teach it.	A		0.66		
Material taught too difficult, so students need to be taught thoroughly.	A		1.99	1.41	
Students learn for passing exams, and therefore they don't need to bother themselves with unnecessary work.	A				2.08
Guiding should only start after First Year.	B	0.49			
The issue of lecturing, as opposed to teaching, should not be taken too far.	B	0.49	0.66	2.82	
Lecturers should give basics, but teach difficult topics in more detail.	B				2.08
Lecturers must supply all the information, it might be too difficult for students to find relevant information from books, or to find the books themselves.	B	1.46	1.99		2.08
Even though students should be guided, lecturers should make sure they give them a lot of relevant information and references, and make sure they understand.	B	2.44	2.65	8.45	2.08
Lecturers should supply all information, up to the student to do further work or not.	B	1.46			4.17
Should guide them to work independently, but be linient in setting and marking exams.	B	0.49			
Lecturers should supply enough information to students. Sometimes books don't have all the helpful information.	B	0.98			
There are issues that a student could never get to know on their own, unless instructed by lecturer.	B	0.98			
Lecturers should supply all the information needed, further reading to be done only if some parts of lectures were not understood.	B	0.49			
They need not provide all, but most of the information.	B	0.49			

APPENDIX 12d

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES - Part 2 Question 4

Question 4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 4 (%)**
With the lecturers' guidance, students would not get lost.	B	0.66			
Some students are scared of research work, but should be given a chance to do well.	B		0.66		
Depends on the teaching method the lecturer uses most.	B			1.41	
Lecturers should supply all the information, students have too much work to do to find time for further study on their own.	B		1.99		2.08
The system does not allow students time to learn, it requires them to memorise to pass. ***	B/C			1.41	
Lecturers should give most of the information, but students to read further to get other views.	B/C	1.46			
They should give all the information, but students have to expand on it.	B/C				2.08
Ideally, self-teaching would ensure a lot of success, but in real life people need external motivation, guidance, and all correct information.	B/C	0.98			
They should give all the information out and leave students to evaluate it and pick out what they think is best.	B/C	0.49			
Too much material and too many students, but not enough time to cover it, so independent research necessary.	B/C	7.80	11.9	7.04	2.08
Students are obliged to conduct independent study and research as a follow up on what was taught (syllabus) and to get more detailed information and different views, to improve their understanding and broaden their scope and knowledge, lecturers to provide only outlines.	C	19.0	24.5	15.5	35.4
Students should be given the chance to work on their own, which promotes self-reliance, responsibility and accountability (skills needed for life after university)	C	10.7	3.97	9.86	8.33
Independent working results in better understanding and learning and stimulates broader thinking (broadens minds).	C	9.75	7.28	7.04	4.17
Prepares students for the future.	C	2.93			
This is what university is all about.	C	2.44		2.82	
This is the way things should be.	C	0.49	1.32		
Helps students meet challenges.	C	1.95			
Information found independently is not easy to forget.	C	1.46		4.32	
A lecturer might not be able to find all the necessary information or might not know everything or even make mistakes, so students should research.	C	1.46	1.99		4.17
If not given the opportunity to work independently, students would end up being dull and lazy.	C	0.98	3.31	2.82	4.17
Makes it easy to separate hard workers from lazy students.	C	0.49			
Students should try and make sense of what the lecturer presents and check how much they understand.	C	0.49	0.66	2.82	
Lecturers have to stimulate students' interest in their work.	C	0.49	1.32		
It's the students who want to learn and are going to sit the exams, so they should do the work themselves with the help of lecturers.	C	0.49	1.32	1.41	
Students should not rely only on lecturers' views, they should give theirs as well.	C		1.32	1.41	4.17
Not wise to rely totally on lecturers as people have different ways of learning.	C	0.49			
Independent learners make better researchers.	C	0.49			

APPENDIX 12d

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES - Part 2 Question 4

Question 4: Lecturers are not there to give students all the information they need, but they are there to guide them in their learning. **COMMENT**	**Position**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 4 (%)**
Education is a two-way process, both lecturer and student have to participate and learn from each other.	C	0.98	2.65	4.32	
Students need to apply what they learn to other situations.	C		0.66		
Students also need to acquire techniques of analysis, critique and evaluation.	C				4.17
Scientific knowledge is continuously changing, so students need to do research.	C		0.66	2.82	2.08
Sometimes lectures are not even necessary.	C			1.41	

APPENDIX 12e

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 5

Question 5: Examinations should be confined only to what was taught. **COMMENT**	**Position**	**Year 1 (%)**	**Year 2 (%)**	**Year 3 (%)**	**Year 4 (%)**
One cannot, and shouldn't be tested on something they have not been taught or don't know (that would be unfair and shows ignorance)	A	14.6	12.6	15.5	31.3
In practice, students study, understand and have knowledge only on what they are taught or told to study.	A	4.88	3.97	2.82	4.17
Impossible to know and understand everything one comes across on their own.	A	2.93	2.65		
Exams are there to test one's understanding of taught material, not general information or their efficiency at doing independent learning.	A	2.44	5.96	8.45	6.25
This would show diligence, and that students have learnt and can apply what they learnt.	A	1.46	0.66		
If not taught, students might carry misconceptions.	A	1.46			
In their lecturing, lecturers should be supplying all what students need.	A		0.66		
If exams are going to cover material outwith lectures, then lectures are a complete waste of time.	A	0.49	1.32		
Lecturers might end up coming up with very difficult questions if they do not examine only on what was taught.	A		1.32		
This would stop lecturers from failing students deliberately.	A				2.08
Taught material already too challenging, so students have to work hard at mastering this.	A			1.41	
The presence of unknown material or that not taught in class would cause failure through panic.	A	0.49			
Students expect to be examined only on what was taught.	A				2.08
Exam content usually surprises students, and this should not be so.	A			1.41	
This is the way things should be, if students fail in this case, they would deserve it and could only have themselves to blame.	A		1.32		
What's taught in lectures is what is in the course outline, therefore what is required, and only this should be tested so that students know what to study. Otherwise it would be unfair.	A/B	4.39	6.62	11.3	2.08
This would make preparation for exams easier.	B	1.46	0.66		
Exams should be composed predominantly, of taught material.	B			1.41	
This would allow students to know what they will be tested on, otherwise they might overburden themselves with irrelevant material and fail.	B	9.27	11.3	4.23	8.33
Too much material to cover as it is., but there isn't enough time.	B	7.80	6.62	8.45	6.25
Students are too stressed up during exam time to do extra work.	B			4.23	
This would make sure everyone passes well.	B	1.95	3.97	4.23	4.17
Not easy to get hold of further information, might not be enough books in the library.	B	1.95	1.99		
Even if further reading is done, it's done around what's taught.	B	1.46	1.32		
This would pose unfair disadvantage to those who might not have come across the material.	B	0.98	1.32	1.41	
Even though some students might be lazy to learn independently, they are good at absorbing what is taught.	B	0.98			
Challenges should be brought during the course, not during exams, which should test only basic knowledge.	B	0.49	0.66	1.41	

APPENDIX 12e

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 5

Question 5: Examinations should be confined only to what was taught. COMMENT	Position	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 4 (%)
This should be done only for final exams, and not CA.	B	0.49			
Students have differing abilities.	B	0.49			
If included, material not taught should be optional, not compulsory to answer.	B			1.41	
Biology is too wide a subject for students to cover everything about it.	B		0.66	1.41	
This should be so, but those extra effort should be rewarded.	B/C				2.08
As long as areas of further reading are prescribed and relevant sources told to the students.	B/C		0.66		
Learning occurs in stages, and one should not be tested on things not yet learnt or too advanced to understand.	B/C		1.32		
Even though there isn't enough time for extra research this should be done (to a limited extent).	B/C	0.49	5.30		2.08
Agree, but exams should also test for anything related to taught material.	B/C	3.90		2.82	14.6
Students forced to memorise by the system, otherwise they would fail. The system needs to trim off students due to shortage of facilities.	C			1.41	2.08
Exams should contain some stuff not taught, and should challenge students to apply what they covered so that they can be broad-minded, instead of demanding regurgitation.	C	10.7	3.97	11.3	8.33
Students would have gained very little knowledge in the end, the focus would be on passing exams only.	C	4.39			
Students are expected to read further than their notes, as lectures are too basic.	C	2.93	2.65		
There are loads of other sources to be considered.	C		1.32		
Students' thinking abilities would be limited, and they won't be prepared for life after university.	C	2.44	3.97		
This would show too much dependence on lecturers only.	C	1.46			
This would promote laziness, hence poor performance in students.	C		1.32		
Tests should be done to assess natural intelligence.	C	0.98			
This would encourage rote learning in students.	C	0.98			
Exams test learning, not memorising.	C			2.82	
Lecturers are not infallible, and might miss things out.	C		0.66		
Students should be trained to think abstractly and not only meet such demanding questions only during exams.	C		0.66		

APPENDIX 12f

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 6

Question 6: I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. COMMENT	Position	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 4 (%)
Just don't like expressing my views, not in my character to do so.	A	5.85	1.32		
I am an asocial type of person.	A				4.17
Don't want others to laugh at or criticize me.	A	1.46	4.64	2.82	4.17
Embarassed of making mistakes and making a fool of myself.	A			2.82	
Never make opinions or ask questions, they lead to confusion.	A	1.46		1.41	
I prefer to keep quiet and consult lecturer later on, on my own.	A	1.46	0.66	1.41	2.08
Sometimes my ideas don't make sense.	A	0.98	0.66		
Never prepared enough to contribute anything in class.	A	0.49	0.66		
Hide myself if I don't understand.	A	0.49			
Never understand anything in class to express opinions.	A	0.49	1.32	4.23	2.08
One understands better and learns more if they are quiet.	A		0.66		
Lecturers and supervisors are there to be relied on.	A		0.66		
Lecturers are more knowledgeable than students, so students should leave the talking to them.	A			1.41	
Don't want to disturb those who already understand.	A	0.49			
Too many people and too much to do in lectures and not enough time, so expressing one's views then seen as a waste of time.	B	7.32	3.97	4.23	2.08
Only express myself sometimes (e.g. discussions, smaller groups, after listening, etc.)	B	5.85	7.95	7.04	6.25
Express myself only if I understand the subject well.	B	0.49			
Express myself only if I don't understand.	B			1.41	
Might have ideas, but generally to shy to express myself.	B	4.88	2.65	1.41	2.08
I find it difficult to express myself well.	B	3.90	3.97	2.82	4.17
Too many people in lecture theatres, atmosphere too intimidating for one to pose views or ask questions.	B	3.90	3.97	7.04	
Not everyone is able to ask some questions.	B	0.49			
Some lecturers laugh at, criticize, intimidate or even ignore students when they ask.	B	3.90	0.66	7.04	6.25
I usually have conflicting views.	B	0.49			
One needs to be smart enough to be able to express oneself without confusing themselves.	B	0.49			
Do it, but not for the purpose of showing off, have to have respect for time.	B	0.49	0.66		
Don't want to appear boastful.	B	0.49			

APPENDIX 12f

UNIVERSITY OF BOTSWANA COMMENT CATEGORIES – Part 2 Question 6

Question 6: I am very confident in myself and like expressing my opinions and views during lectures, discussions, labs, etc. COMMENT	Position	Year 1 (%)	Year 2 (%)	Year 3 (%)	Year 4 (%)
Would like to do it, but sometimes don't get the chance to do so.	B	0.49			
Don't want to upset lecturers with my views and questions, they might end up failing me.	B	0.49	0.66		
Not too confident, just okay.	B		0.66		
Might be confident but just don't like airing my views.	B/C			4.23	
I am confident, but prefer and enjoy to solve problems on my own.	B/C		0.66		
Although this is a very good thing to do, students' ideas don't seem to matter. ***	B/C		2.65		
Students' ideas don't seem to matter much as there are set answers to everything already. ***	B/C		0.66	1.41	
Like expressing myself even though students' views don't seem to matter. ***	B/C			1.41	
Might not be confident in myself, but like expressing views so as to evaluate my understanding.	B/C			1.41	
One gets a chance to see if they are wrong or right (weaknesses or strengths revealed and level of understanding evaluated).	C	4.39	5.30	5.63	10.4
Gives one the opportunity to be criticised and corrected if they hold wrong information; misconceptions cleared.	C	7.32	7.28	11.3	14.6
If one doesn't understand, things get clarified for them and doubts are cleared (improves understanding, therefore better performance).	C	10.2	9.27		8.33
Gives one a chance to share information or opinions with others, therefore learning more from each other.	C	3.41	4.64	1.41	2.08
One has to express their opinions and views to show that they understand what they're talking about.	C	0.49			
Learning best done this way, one's actively involved and kept informed.	C	2.93	2.65	1.41	2.08
Lack of confidence leads to difficulties in passing the course.	C	2.44			
Things stay longer in the mind and/or are easy to remember after discussion.	C	1.46			
It's in my nature to speak out, ask questions, or argue if need be.	C	1.46	1.32	1.41	4.17
One needs to stand up for their beliefs, ask questions where they don't understand, otherwise they would be brainwashed.	C			2.82	4.17
There has to be freedom of opinion/expression in class, so one has to air their views.	C	0.98			2.08
I believe in myself.	C	0.98	1.32		2.08
Improves students' confidence and fosters positive thinking.	C	0.49	1.32		
Feels good to participate in class.	C	0.49			
It's the students' responsibility to participate in order to improve their chances of success.	C	0.49			
Develops scientific culture.	C	0.49			
Prepares one for the future, to fit in with the rest of the society.	C				2.08
A final year student has to show confidence in themselves.	C				2.08
Motivates one to read more and have a broadened mind, so as to contribute during discussions.	C		0.66		2.08
Allows people to challenge each other.	C		0.66		
Some lecturers defend themselves when challenged.	C				2.08

APPENDIX 13

Part 1 – Numbers and Percentages of Students Who Chose the Different Options at Level 1 and Level 2 (Followed Group)

APPENDIX 13

PART 1 - NUMBERS AND PERCENTAGES OF STUDENTS WHO CHOSE THE DIFFERENT OPTIONS AT LEVEL 1 AND LEVEL 2 (N=19)

Change	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
1-5:A-C	-	-	-	-	-	-	1 (5.26)	-	-	-	-
1-4:A-C	-	-	-	-	-	-	-	-	-	-	-
2-5:A-C	-	-	-	-	-	-	1 (5.26)	-	-	-	-
2-4:A-C	-	-	-	-	-	-	3 (15.8)	-	-	-	-
1-3:A-B	1 (5.26)	-	-	-	-	-	-	-	1 (5.26)	1 (5.26)	-
2-3:A-B	-	-	1 (5.26)	-	-	-	-	-	1 (5.26)	2 (10.5)	-
1-2:A-A	-	-	-	-	-	-	-	-	2 (10.5)	-	-
1-1:A-A	-	-	-	-	-	-	-	-	-	-	-
2-2:A-A	-	-	1 (5.26)	-	-	-	-	1 (5.26)	1 (5.26)	**6 (31.6)**	-
2-1:A-A	-	-	-	-	-	-	-	-	-	1 (5.26)	-
3-5:B-C	1 (5.26)	1 (5.26)	1 (5.26)	-	1 (5.26)	1 (5.26)	2 (10.5)	1 (5.26)	-	-	-
3-4:B-C	2 (10.5)	**5 (26.3)**	3 (15.8)	2 (10.5)	3 (15.8)	1 (5.26)	2 (10.5)	1 (5.26)	3 (15.8)	-	**5 (26.3)**
3-3:B-B	-	2 (10.5)	1 (5.26)	-	3 (15.8)	1 (5.26)	-	-	3 (15.8)	1 (5.26)	1 (5.26)
3-2:B-A	-	-	-	-	-	-	-	-	2 (10.5)	**5 (26.3)**	-
3.1:B-A	-	-	-	-	-	-	-	-	1 (5.26)	-	-
5-5:C-C	3 (15.8)	1 (5.26)	2 (10.5)	4 (21.1)	1 (5.26)	2 (10.5)	2 (10.5)	**5 (26.3)**	-	-	3 (15.8)
5-4:C-C	1 (5.26)	2 (10.5)	-	2 (10.5)	3 (15.8)	4 (21.1)	1 (5.26)	1 (5.26)	2 (10.5)	-	**5 (26.3)**
4-5:C-C	2 (10.5)	2 (10.5)	1 (5.26)	1 (5.26)	1 (5.26)	2 (10.5)	2 (10.5)	2 (10.5)	-	-	-
4-4:C-C	4 (21.1)	4 (21.1)	**5 (26.3)**	**6 (31.6)**	**5 (26.3)**	4 (21.1)	3 (15.8)	**5 (26.3)**	1 (5.26)	-	2 (10.5)
5-3:C-B	1 (5.26)	-	-	-	-	1 (5.26)	-	-	-	-	-
4-3:C-B	2 (10.5)	-	-	2 (10.5)	-	1 (5.26)	-	1 (5.26)	-	1 (5.26)	-
5-2:C-A	-	-	-	-	-	-	-	-	-	-	-
5-1:C-A	-	-	-	-	-	-	-	-	-	-	-
4-2:C-A	-	-	2 (10.5)	-	-	-	-	-	-	-	-
4-1:C-A	-	-	-	-	-	-	-	-	-	-	1 (5.26)
?	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)	2 (10.5)

NOTE: The numbers and letters in the 'change' column indicate the options on the questionnaire scale and the Perry categories they represent. A cell with '1-5: A-C' for instance, shows that the students chose option 1 (Perry 'A' category) at 1st Year and changed to option 5 (Perry 'C' category) at 2nd Year. The numbers in brackets are the proportions of students who underwent the changes, while the numbers beside them are raw frequencies of the same. The Question mark in the column for changes represents instances where the students did not choose any position on the scale. The numbers in **bold** indicate the instances where over 25% of the students underwent the change in perception or chose the same option again.

APPENDIX 14

Part 1 - Numbers and Percentages of Students who Chose the Different Options at Level 2 and Level 3 (Followed Group)

APPENDIX 14

PART 1 - NUMBERS AND PERCENTAGES OF STUDENTS WHO CHOSE THE DIFFERENT OPTIONS AT LEVEL 2 AND LEVEL 3 (N=19)

Change	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**
1-5:A-C	-	-	-	-	-	-	-	-	-	-	-
1-4:A-C	-	-	-	-	-	-	-	-	-	-	-
2-5:A-C	-	-	-	-	-	-	-	-	-	-	-
2-4:A-C	-	-	1 (5.26)	-	-	-	-	1 (5.26)	-	-	-
1-3:A-B	-	-	-	-	-	-	-	-	1 (5.26)	-	1 (5.26)
2-3:A-B	-	-	2 (10.5)	-	-	-	-	-	2 (10.5)	2 (10.5)	-
1-2:A-A	-	-	-	-	-	-	-	-	-	1 (5.26)	-
1-1:A-A	-	-	-	-	-	-	-	-	-	-	-
2-2:A-A	1 (5.26)	-	-	-	-	-	-	-	3 (15.8)	**6 (31.6)**	-
2-1:A-A	-	-	-	-	-	-	-	-	-	3 (15.8)	-
3-5:B-C	-	1 (5.26)	1 (5.26)	-	-	1 (5.26)	-	1 (5.26)	-	-	1 (5.26)
3-4:B-C	4 (21.1)	1 (5.26)	-	2 (10.5)	-	1 (5.26)	-	-	1 (5.26)	-	-
3-3:B-B	-	-	1 (5.26)	-	3 (15.8)	-	-	1 (5.26)	**5 (26.3)**	1 (5.26)	-
3-2:B-A	-	-	-	-	-	-	-	-	-	4 (21.1)	-
3.1:B-A	-	-	-	-	-	1 (5.26)	-	-	-	1 (5.26)	-
5-5:C-C	4 (21.1)	1 (5.26)	2 (10.5)	4 (21.1)	-	2 (10.5)	**6 (31.6)**	**5 (26.3)**	-	-	3 (15.8)
5-4:C-C	2 (10.5)	3 (15.8)	3 (15.8)	2 (10.5)	2 (10.5)	3 (15.8)	3 (15.8)	1 (5.26)	-	-	1 (5.26)
4-5:C-C	3 (15.8)	2 (10.5)	1 (5.26)	1 (5.26)	-	4 (21.1)	1 (5.26)	2 (10.5)	-	-	1 (5.26)
4-4:C-C	3 (15.8)	**8 (42.1)**	4 (21.1)	**8 (42.1)**	**7 (36.8)**	**5 (26.3)**	**7 (36.8)**	**5 (26.3)**	4 (21.1)	-	**8 (42.1)**
5-3:C-B	-	-	-	-	1 (5.26)	1 (5.26)	-	-	-	-	-
4-3:C-B	1 (5.26)	2 (10.5)	3 (15.8)	1 (5.26)	**5 (26.3)**	-	1 (5.26)	1 (5.26)	2 (10.5)	1 (5.26)	3 (15.8)
5-2:C-A	-	-	-	-	-	-	-	-	-	-	-
5-1:C-A	-	-	-	-	-	-	-	-	-	-	-
4-2:C-A	-	-	-	-	-	-	-	-	-	-	-
4-1:C-A	-	-	-	-	-	-	-	-	-	-	-
?	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)

NOTE: The numbers and letters in the 'change' column indicate the options on the questionnaire scale and the Perry categories they represent. A cell with '1-5: A-C' for instance, shows that the students chose option 1 (Perry 'A' category) at 2nd Year and changed to option 5 (Perry 'C' category) at 3rd Year. The numbers in brackets are the proportions of students who underwent the changes, while the numbers beside them are raw frequencies of the same. The Question mark in the column for changes represents instances where the students did not choose any position on the scale. The numbers in **bold** indicate the instances where over 25% of the students underwent the change in perception or chose the same option again.

APPENDIX 15

Part 1 - Numbers and Percentages of Students who Chose the Different Options at Level 1 and Level 3 (Followed Group)

APPENDIX 15

PART 1 - NUMBERS AND PERCENTAGES OF STUDENTS WHO CHOSE THE DIFFERENT OPTIONS AT LEVEL 1 AND LEVEL 3

(N=19)

Change	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
1-5:A-C	-	-	-	-	-	-	-	-	-	-	-
1-4:A-C	1 (5.26)	-	-	-	-	-	1 (5.26)	-	-	-	-
2-5:A-C	-	-	-	-	-	-	2 (10.5)	-	-	-	-
2-4:A-C	-	-	-	-	-	-	1 (5.26)	1 (5.26)	-	-	-
1-3:A-B	-	-	-	-	-	-	-	-	2 (10.5)	-	-
2-3:A-B	-	-	2 (10.5)	-	-	-	1 (5.26)	-	1 (5.26)	1 (5.26)	-
1-2:A-A	-	-	-	-	-	-	-	-	1 (5.26)	1 (5.26)	-
1-1:A-A	-	-	-	-	-	-	-	-	-	-	-
2-2:A-A	-	-	-	-	-	-	-	-	1 (5.26)	**7 (36.8)**	-
2-1:A-A	-	-	-	-	-	-	-	-	-	2 (10.5)	-
3-5:B-C	1 (5.26)	1 (5.26)	3 (15.8)	-	-	-	2 (10.5)	1 (5.26)	-	-	1 (5.26)
3-4:B-C	1 (5.26)	**5 (26.3)**	-	2 (10.5)	1 (5.26)	1 (5.26)	3 (15.8)	1 (5.26)	3 (15.8)	-	3 (15.8)
3-3:B-B	1 (5.26)	2 (10.5)	2 (10.5)	-	**6 (31.6)**	1 (5.26)	-	-	**5 (26.3)**	1 (5.26)	2 (10.5)
3-2:B-A	-	-	-	-	-	-	-	-	1 (5.26)	3 (15.8)	-
3.1:B-A	-	-	-	1 (5.26)	-	1 (5.26)	-	-	-	2 (10.5)	-
5-5:C-C	3 (15.8)	2 (10.5)	-	3 (15.8)	1 (5.26)	**5 (26.3)**	2 (10.5)	3 (15.8)	-	-	4 (21.1)
5-4:C-C	2 (10.5)	1 (5.26)	2 (10.5)	3 (15.8)	3 (15.8)	3 (15.8)	1 (5.26)	4 (21.1)	2 (10.5)	-	4 (21.1)
4-5:C-C	3 (15.8)	1 (5.26)	1 (5.26)	1 (5.26)	-	3 (15.8)	2 (10.5)	1 (5.26)	-	-	-
4-4:C-C	**5 (26.3)**	**6 (31.6)**	**6 (31.6)**	**7 (36.8)**	**5 (26.3)**	4 (21.1)	3 (15.8)	**5 (26.3)**	1 (5.26)	-	2 (10.5)
5-3:C-B	-	-	-	-	1 (5.26)	1 (5.26)	-	-	-	-	1 (5.26)
4-3:C-B	1 (5.26)	-	2 (10.5)	1 (5.26)	1 (5.26)	1 (5.26)	-	2 (10.5)	1 (5.26)	1 (5.26)	1 (5.26)
5-2:C-A	-	-	-	-	-	-	-	-	-	-	-
5-1:C-A	-	-	-	-	-	-	-	-	-	-	-
4-2:C-A	-	-	-	-	-	-	-	-	-	-	-
4-1:C-A	-	-	-	-	-	-	-	-	-	-	-
?	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1 (5.26)	1(5.26)

NOTE: The numbers and letters in the 'change' column indicate the options on the questionnaire scale and the Perry categories they represent. A cell with '1-5: A-C' for instance, shows that the students chose option 1 (Perry 'A' category) at 1st Year and changed to option 5 (Perry 'C' category) at 3nd Year. The numbers in brackets are the proportions of students who underwent the changes, while the numbers beside them are raw frequencies of the same. The Question mark in the column for changes represents instances where the students did not choose any position on the scale. The numbers in **bold** indicate the instances where over 25% of the students underwent the change in perception or chose the same option again.

APPENDIX 16

Part 2 – Numbers and Percentages of Students who Gave Statements Qualifying as Different Perry Categories at Level 1 and Level 2

APPENDIX 16

PART 2 – NUMBERS AND PERCENTAGES OF STUDENTS WHO GAVE STATEMENTS QUALIFYING AS DIFFERENT PERRY CATEGORIES AT LEVEL 1 AND LEVEL 2 (N=19)

Change	Question 1	Question 2	Question 3	Question 4	Question 5
A – A/B	-	-	-	-	1 (5.26)
A (syst) – A/B	1 (5.26)	-	-	-	-
A (syst) – B/C (syst)	1 (5.26)	-	-	-	-
A – B/C	-	-	-	1 (5.26)	-
A/B – A (syst)	-	-	-	-	1 (5.26)
A/B – A/B	-	-	-	-	1 (5.26)
A/B - B	-	-	-	1 (5.26)	1 (5.26)
A/B – B/C	-	-	-	1 (5.26)	-
B - B	1 (5.26)	1 (5.26)	-	2 (10.5)	1 (5.26)
B – B/C	-	-	-	-	3 (15.8)
B - C	1 (5.26)	2 (10.5)	-	-	-
B/C – A (syst)	-	-	1 (5.26)	-	-
B/C – A/B	-	-	-	-	1 (5.26)
B/C - B	-	1 (5.26)	-	1 (5.26)	-
B/C – B/C	3 (15.8)	-	-	-	2 (10.5)
B/C - C	2 (10.5)	-	1 (5.26)	1 (5.26)	-
C – A/B	1 (5.26)	-	-	2 (10.5)	1 (5.26)
C - B	2 (10.5)	2 (10.5)	3 (15.8)	3 (15.8)	4 (21.1)
C – B/C	2 (10.5)	-	-	-	-
C - C	**5 (26.3)**	**7 (36.8)**	**14 (73.7)**	**7 (36.8)**	1 (5.26)
C – C (Q miconst)	-	1 (5.26)	-	-	-
C – (Q misconst)	-		-	-	1 (5.26)
(Q misconst) - B	-	1 (5.26)	-	-	1 (5.26)
(Q misconst) - C	-	4 (21.1)	-	-	-

The letters in the 'change' column are the different positions in the Perry scheme that the students' statements qualified as at one level and at the next level. The A/B and B/C categories are the transitional stages between the main Perry categories. Where the students indicated that they felt 'forced' by the system to act in a certain way, the Perry category is followed with (syst), for system. In some cases the students seemed to have misconstrued the questions, and this was indicated by writing (Q misconst), for question misconstrued. In some of these cases, the statements could be properly categorised, and the Perry categories into which they fell were written alongside, e.g. (Q misconst - B). The numbers in bold indicate instances where the proportions of students who underwent certain changes in perceptions were over 25 %.

APPENDIX 17

Part 2 – Numbers and Percentages of Students who Gave Statements Qualifying as Different Perry Categories at Level 2 and Level 3

APPENDIX 17

PART 2 – NUMBERS AND PERCENTAGES OF STUDENTS WHO GAVE STATEMENTS QUALIFYING AS DIFFERENT PERRY CATEGORIES AT LEVEL 2 AND LEVEL 3 (N=19)

Change	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
A - A				-		1 (5.26)
A – A/B	1 (5.26)	-	-	-	-	-
-A (syst) – B/C	-	-	-	-	1 (5.26)	-
A (syst) – B/C (syst)	1 (5.26)	-	-	-	-	-
A (syst) – B	-	-	1 (5.26)	-	-	-
A – B/C	-	-	-	-	-	1 (5.26)
A/B – A/B	-	-	-	-	1 (5.26)	-
A/B - B	-	-	-	1 (5.26)	1 (5.26)	1 (5.26)
A/B – C	-	-	-	1 (5.26)	-	2 (10.5)
B - A	-	1 (5.26)	-	1 (5.26)	-	1 (5.26)
B – A/B	1 (5.26)	-	-	-	-	-
B - B	1 (5.26)	1 (5.26)	-	1 (5.26)	4 (21.1)	1 (5.26)
B (syst) - B	1 (5.26)	-	-	-	-	-
B – B/C	-	1 (5.26)	-	3 (15.8)	1 (5.26)	3 (15.8)
B - C	1 (5.26)	2 (10.5)	3 (15.8)	2 (10.5)	2 (10.5)	1 (5.26)
B (syst) - C	1 (5.26)	-	-	-	-	-
B/C – A	-	-	-	-	-	1 (5.26)
B/C - A/B	-	-	-	1 (5.26)	-	1 (5.26)
B/C - B	-	-	-	1 (5.26)	2 (10.5)	-
B/C – B/C	3 (15.8)	-	-	-	3 (15.8)	1 (5.26)
B/C - C	1 (5.26)	-	-	-	-	-
C - A	-	1 (5.26)	-	-	-	-
C – A/B	-	1 (5.26)	-	-	-	2 (10.5)
C - B	1 (5.26)	-	1 (5.26)	1 (5.26)	-	1 (5.26)
C – B/C	2 (10.5)	-	1 (5.26)	2 (10.5)	-	1 (5.26)
C - C	4 (21.1)	**11 (57.9)**	**13 (68.4)**	**5 (26.3)**	1 (5.26)	2 (10.5)
C – C (A/syst)	1 (5.26)	-	-	-	-	-
C(Q misconst) - C	-	1 (5.26)	-	-	-	1 (5.26)
(Q misconst) - C	-	-	-	-	1 (5.26)	-

The letters in the 'change' column are the different positions in the Perry scheme that the students' statements qualified as at one level and at the next level. The A/B and B/C categories are the transitional stages between the main Perry categories. Where the students indicated that they felt 'forced' by the system to act in a certain way, the Perry category is followed with (syst), for system. In some cases the students seemed to have misconstrued the questions, and this was indicated by writing (Q misconst), for question misconstrued. In some of these cases, the statements could be properly categorised, and the Perry categories into which they fell were written alongside, e.g. (Q misconst - B). The numbers in bold indicate instances where the proportions of students who underwent certain changes in perceptions were over 25 %.

APPENDIX 18

Part 2 – Numbers and Percentages of Students who Gave Statements Qualifying as Different Perry Categories at Level 1 and Level 3

APPENDIX 18

PART 2 – NUMBERS AND PERCENTAGES OF STUDENTS WHO GAVE STATEMENTS QUALIFYING AS DIFFERENT PERRY CATEGORIES AT LEVEL 1 AND LEVEL 3 (N=19)

Change	Question 1	Question 2	Question 3	Question 4	Question 5
A – A/B		-	-	1 (5.26)	-
-A (syst) – A/B	1 (5.26)	-	-	-	-
A - B	-	-	-	-	1 (5.26)
A (syst) – B/C (syst)	1 (5.26)	-	-	-	-
A/B – A	-	-	-	1 (5.26)	-
A/B – A/B	-	-	-	-	1 (5.26)
A/B - B	-	-	-	1 (5.26)	1 (5.26)
A/B – B/C	-	-	-	-	1 (5.26)
B - A	-	1 (5.26)	-	-	-
B - B	1 (5.26)	-	-	-	2 (10.5)
B – B/C	-	-	-	1 (5.26)	2 (10.5)
B - C	1 (5.26)	2 (10.5)	-	1 (5.26)	-
B/C - B	-	-	1 (5.26)	1 (5.26)	1 (5.26)
B/C – B/C	3 (15.8)	1 (5.26)	-	1 (5.26)	2 (10.5)
B/C - C	2 (10.5)	-	1 (5.26)	-	-
C – A/B	1 (5.26)	-	-	-	-
C - B	2 (10.5)	1 (5.26)	1 (5.26)	1 (5.26)	3 (15.8)
C – B/C	2 (10.5)	-	1 (5.26)	4 (21.1)	1 (5.26)
C - C	4 (21.1)	**9 (47.4)**	**15 (78.9)**	**7 (36.8)**	3 (15.8)
C – C (A/syst)	1 (5.26)	-	-	-	-
B (Q misconst) - A	-	1 (5.26)	-	-	-
(Q misconst) – A/B	-	1 (5.26)	-	-	-
(Q misconst) - C	-	3 (15.8)	-	-	1 (5.26)

The letters in the 'change' column are the different positions in the Perry scheme that the students' statements qualified as at one level and at the next level. The A/B and B/C categories are the transitional stages between the main Perry categories. Where the students indicated that they felt 'forced' by the system to act in a certain way, the Perry category is followed with (syst), for system. In some cases the students seemed to have misconstrued the questions, and this was indicated by writing (Q misconst), for question misconstrued. In some of these cases, the statements could be properly categorised, and the Perry categories into which they fell were written alongside, e.g. (Q misconst - B). The numbers in bold indicate instances where the proportions of students who underwent certain changes in perceptions were over 25 %.